Chemical Age

ITALIAN CHEMICAL INDUSTRY
(page 319)

VOL. 78 No. 1990

31 August 1957

INDEX TO ADVERTISERS

The first figures refer to advertisement in **Chemical Age Year Book**, *the second to the current issue*

continued on page 312

INDEX TO ADVERTISERS

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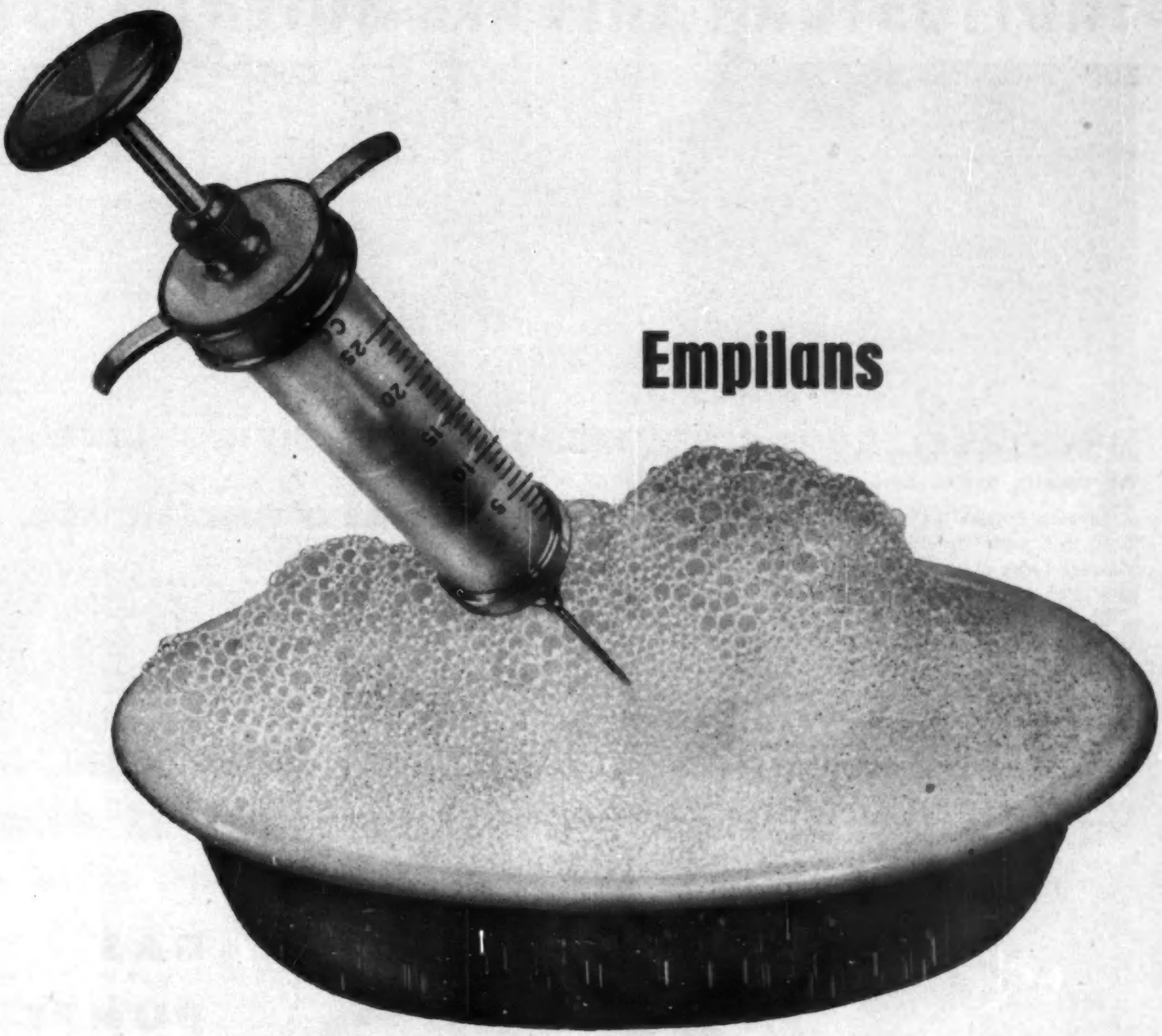

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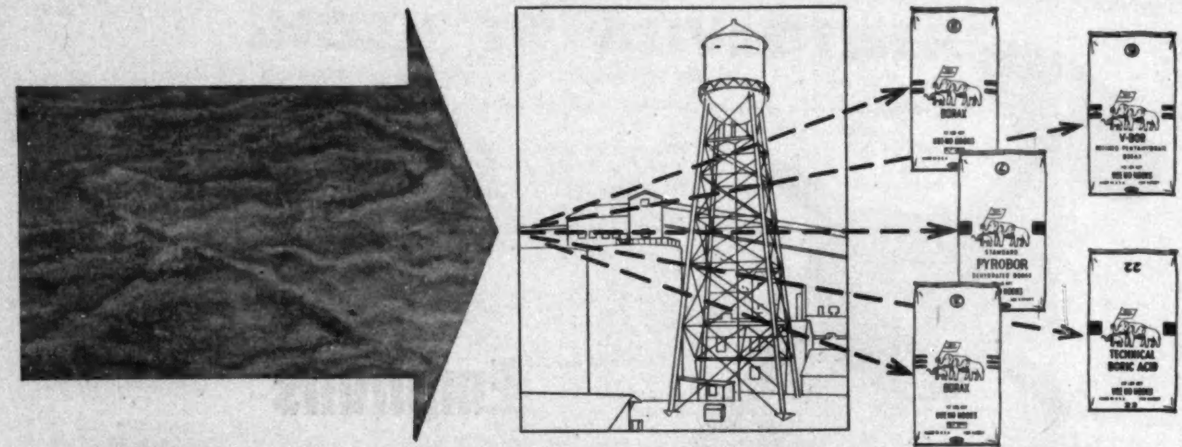

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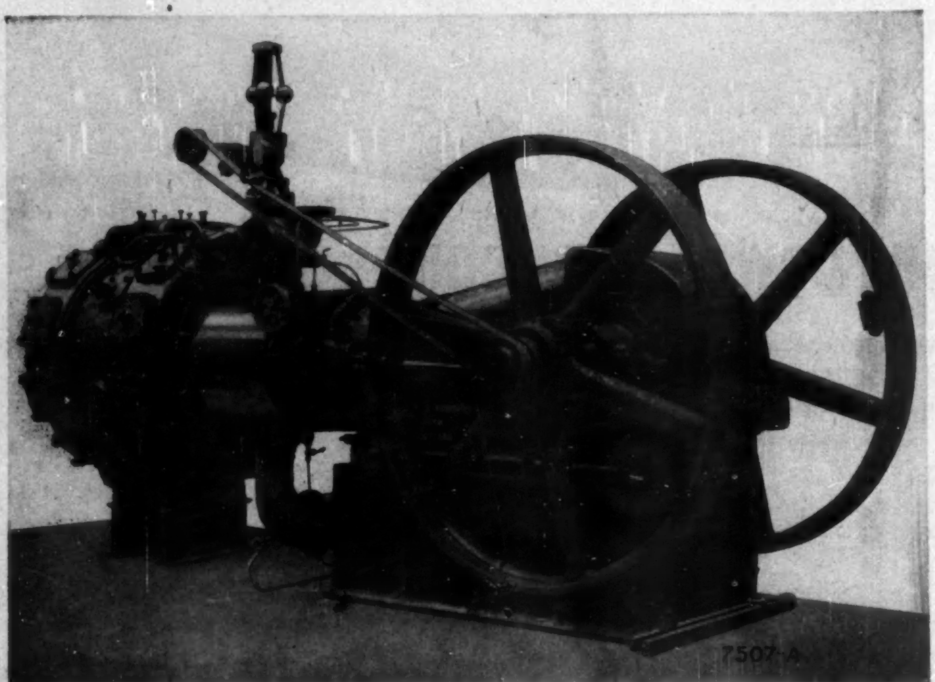

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The MIRRLEES WATSON COMPANY LIMITED

VOL. 78 No. 1990
31 AUGUST 1957

Telephone: **FLEet Street 3212** *(26 Lines)*
Telegrams: **Allangas · Fleet · London**

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IN THIS ISSUE

Annual subscription is 52s 6d ($7.40), single copies 1s 3d (by post 1s 6d).

CHEMICAL AGE

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

BREACH OF FAITH

GENERALLY, the industry-university relationship is satisfactory. There are a few points of contention, particularly arising from the scramble each year to recruit graduates. But, on the whole, industry is satisfied with the graduates it receives and the graduates are content with their role in industry. This much is clear from 'Graduates in Industry', the second Political and Economic Planning (PEP) report on the study of industry and the university graduate (George Allen and Unwin, 262 pp., price 30s).

Of the 47 undertakings that made up the sample on which the second survey is based, four of them came from the chemical and allied industries. About a fifth of the graduates interviewed went into the chemical industry. Of these, 81 said they were intelligently employed—the highest proportion by industry groups to say so. Of the 42 who received a training course in the chemical industry, 79 per cent said they were intelligently employed; 82 per cent of the 76 who had no training course in the industry also thought they were intelligently employed.

Graduates in the chemical and allied industries were those most satisfied with pay prospects; they were also nearly at the head of the list of those satisfied with promotion prospects.

Six in 10 of all the graduates interviewed had no formal training. Both they and their firms seemed satisfied that this was either not necessary or not possible due to the nature of the work. Most of the science graduates and technologists did not mind not having a training course, but the arts graduates did. Where it existed, training had two main aims: either to 'size-up' the graduate to see what work he was best fitted for, or to train him for a specific job.

Most managements considered that initially graduates should do the same work as non-graduates, if only for the sake of broader experience. This did not, however, apply to graduates employed on research work. There was little complaint of graduates' talent being wasted on unsuitable work.

Most of the graduates interviewed seemed to like taking control of process operations as part of their training. In fact, the survey declares that there is a strong case for the supervision of costly and complex plant by highly trained people able to get the maximum return from it. This type of work is coming increasingly to be regarded as the high road to management for the technologist.

The survey underlined previous findings on salary scales for graduates. Initially, academic qualifications place them higher up the scale than the non-graduate, but this advantage is generally not maintained for more than a few years. After three years, only seven firms still paid graduates more than their contemporaries simply on the strength of their degrees. Most firms pay more initially to graduates in view of the strong competition for their services. It seems that a graduate is likely to progress more rapidly than a non-graduate.

The survey reveals criticisms from industry of higher degrees, which it seems are felt to be wasteful. Managements seek post-graduate training of a type that will be of greater help in fitting the graduate to responsibility in industry. In this respect, it is stated that the new advanced course studentships awards of the Department of Scientific and Industrial Research would add greatly to the value of the degree already taken. It is thought that these awards will provide an alternative which will take the form of training as opposed to research work for a doctorate.

These provisions certainly mark an important and promising new stage in the development governing post-university awards. But it is to be hoped they will remain an alternative and that they will never entirely replace the opportunities afforded to graduates of undertaking research for a higher degree; a system that has been of great benefit to British science

Competition for science graduates is fierce and the survey expresses concern at the scramble for their services which is increasing each year. The only solution is, of course, the long term one of an increase in the number of scientists and technologists leaving the universities.

The report was written at a time when it seemed that Whitehall favoured an expansion along these lines. It is said, for instance: 'The current plans for increasing the numbers of university students . . . promise well to go some way at any rate towards this solution'. It was expected that the proposals put forward last autumn would bring the student populations in universities up to 106,000 by the mid-1960's, compared with some 82,000 at the time of the survey. According to the Financial Secretary to the Treasury speaking in the House of Commons in November 1956, it was anticipated that about two-thirds of this increase would study science or technology. He added that the Government would like the universities to consider still further expansion to meet national needs.

Since then, however, the Government seems to have undergone a change of heart. The limited grant given recently by the University Grants Committee will certainly not permit any sizeable scientific expansion for at least five years. Indeed, a number of universities have already expressed the view that they will have to make cuts in scientific teaching staffs and, hence, in the number of science freshmen. In view of the encouragement given previously to universities to expand the science side, the grants are a serious breach of faith.

Perhaps ours is a biased view, but we fail to see why the universities having learned of the cuts in the grants should think, seemingly automatically, in terms of reducing scientific teaching staffs. If cuts have to be made, why not reduce the arts teaching staffs and concentrate on meeting the need for scientific trained persons?

It is to be hoped that the chemical and allied industries will take a strong stand here. Already much of the expansion of chemical and engineering departments in universities has been due to the efforts of these industries.

The chemical industry can also help itself by allowing its trained personnel to teach for periods in the universities thus providing the necessary staff. It is believed that the chemical and engineering industries already have this idea much to the fore. Time is against them it is true. Their trained staffs are already working hard, but it is the trained men in industry who can inspire more enthusiasm in the student about an industrial post as opposed to the purely scholastic trained man. An important question in this respect is whether the university principles are a stumbling block to industry. Would universities agree to industry providing teachers?

There can be no doubt that the untimely parsimony on the part of the Treasury will have most serious effects in the next few years. Britain's vital industries, now expanding rapidly to meet world demand and the possibility of a European free trade area, will be forced to resort to an even more frantic scramble for science graduates in coming years. With fewer graduates to share among more positions calling for their services, a slackening of the industrial momentum is likely to result at a time when it should be reaching its maximum.

The Government should now be considering the spending of much more on the training of scientists and technologists, not less.

AMMONIA PRODUCTION IN THE US

According to a recent survey of ammonia production in the US, at least five more years will pass before synthetic nitrogen supply and demand finally come into balance.

Ammonia production in the US was increased by the Government to supply World War II requirements in 1940. Industry took over most of this capacity in post-war years, when demand was again increased by Korean hostilities. The US Defence Production Administration set the target for nitrogen capacity in 1952 at 2.9 million tons by 1955 including both by-product and synthetic nitrogen. In 1954, the target was amended to 3.5 million tons by January 1957. Many US producers therefore decided to increase their synthetic ammonia capacity consequently giving rise to overcapacity.

Synthetic ammonia capacity at the start of 1957 was 3.6 million tons of nitrogen, equivalent to 4.3 million tons of ammonia. At the end of this year the capacity will be of the order of 5 million tons. However, few new plants are forecast for the immediate future. Du Pont have stated that they are not now planning a new ammonia plant. Additional plants according to US industrialists are coming into production as fast as demand can be created.

For 1957, US ammonia capacity is being kept at 75 per cent. West coast plants are operating at about 70 per cent of capacity. If plants planned for this area continue to be set up, 70 per cent of capacity only will be required. The US view appears to be that if there is no further increase in ammonia capacity beyond that now planned and if demand supports the existing rates of growth, then by 1962 or thereabouts supply and demand may come into balance. Only one factor could alter this picture—a large unforeseen increase in military or industrial consumption.

Nitrogen used in fertilisers totalled about 59 per cent and was used in direct application materials in 1955–56. More anhydrous ammonia was directly applied by farmers than ammonium nitrate. Much difference of opinion exists in the US about ammoniating solutions. Some producers are said to be modernising plants to reduce the amount of ammoniating solutions used, or going out of the business. On the other hand it is considered that increased sales of high analysis and granulated fertilisers will consume more ammoniating solutions.

Industrial demand for ammonia chemicals in the US today is put at 24 to 25 per cent of the total (32 per cent of 1953's total). An increase in use, however, is forecast by virtue of increased use of ammonia to produce chemicals, plastics, explosives and synthetic fibres. Again US opinion differs on this.

Largest volume industrial chemical produced from ammonia is nitric acid. Some 750,000 tons of ammonia were oxidised to nitric acid, of which 75 per cent is used in fertilisers. Explosives take 15 per cent and the remaining 10 per cent is used in other industrial applications. Sixty-five per cent of industrial end-uses are accounted for by explosives, synthetic fibres and textiles, plastics and synthetic resins, ore processing and metal treating, refrigeration, pulp and paper, petroleum refining, rubber processing. The remaining 35 per cent is used for various inorganic and organic chemicals, water treatment, household ammonia, etc.

Nitrogen imports are causing concern to US domestic producers in some areas. In the Gulf Coast areas and Atlantic seaboard, shipments from Europe and South America are stated to be selling below the domestic price, while in the Pacific Northwest and adjoining states imports influence market prices. Some 96 per cent of Canadian fertiliser materials are nitrogenous and are mainly sent to the US.

Concern is also expressed regarding the US outlook for exporting nitrogenous materials for it is believed that nitrogen suppliers unable to sell to the US, will compete with the US's nitrogen export markets.

Italian Chemical Industry in 1956

Imports Increased at Double the Rate of Chemical Exports

CHEMICAL production statistics as compiled by the Italian Central Institute of Statistics (ISTAT) (1938 = 100) show that in 1956 Italy's production of chemicals was valued at 305 as against 279 in 1955 with an increase of 9.3 per cent (general industry increase was 7.6 per cent). In preceding years variations have been from 26 per cent in 1954 (general industry, 10.4 per cent) to 13 per cent in 1955 (general industry 8.9 per cent). These figures and the rest of the information in this article were given by Sig. L. Morandi, president of the Lombardy Section of the Italian Chemical Society and vice-president of Societa Montecatini, in an article published in *La Chimica e l'Industria*, 1957, **39**, No. 5.

Imports by Italy were up last year by 16.9 per cent, with chemical imports up by 25.9 per cent. Italian exports for 1956 rose by 16 per cent but chemicals only rose 10.2 per cent.

Consumption of fertilisers was affected by the marked regression in Italy's agriculture last year as is indicated in the following table.

Table I

Italian Fertiliser Movement

(in millions of tons)

	1955	1956	Difference %
Phosphoric anhydride ...			
Production ...	442	445	+ 0.7
Imports	16	20	+25
Exports	16	22	+37.5
Agricultural consumption ...	423	410	— 3.1
Nitrogen			
Production ...	329	378	+14.9
Imports	8	10	+25
Exports	81	107	+32.1
Agricultural consumption ...	248	257	+ 3.6
Potash			
Production ...	7*	21*	+200
Imports	60	60	—
Exports	—	—	—
Agricultural consumption ...	55	60	+ 9.1

** The great part was composed of potash contained in compound fertilisers, prepared with imported potassium salts.*

Use of compound fertilisers has grown and in 1956, consumption of these was valued at 400,000 tons, about double the 1955 consumption.

An increase of 14.9 per cent occurred in nitrogenous fertilisers while use of phosphatic fertilisers remained practically the same as 1955. A decrease in phosphoric acid consumption was apparent.

Use of nitrogen was marked by an increase of 3.6 per cent and that of potassium by 9 per cent.

Regarding ammonia as a fertiliser which in the US takes up some 20 per cent of the total consumption of nitrogen, it is not considered that Italian agricultural economy would support the investments required by the necessary installations, which comprise appropriate factories, specially protected depots, and cost of transport for the ammonia which must be used in solution.

Italy today is the one European country having a high level of superphosphate production.

The varied forms of nitrogenous fertilisers produced vary from country to country. Ammonium sulphate production is highest in the UK, Italy and Germany produces calcium cyanamide in quantity but Sig. Morandi questions whether it warrants the amount of energy needed to produce it.

Production of insecticides and herbicides increased on the whole, if copper sulphate is excluded, since production diminished in 1956 by 15 per cent (85,000 tons against 100,000 tons in 1955).

Sulphuric acid production in Italy (calculated as monohydrate) passed the two million tons mark. Over the last three years the increase in production has grown less in harmony with chemical industry. Thus: 13.9 per cent in 1954, 6.5 per cent in 1955 and 5.7 per cent in 1956. The contract process was being used and the lead chamber method was being abandoned. Caustic soda production reached 254,000 tons, an increase of 6.7 per cent compared with 1955. The increase in sodium carbonate was only 1 per cent. Organic dyestuffs have remained unchanged for the last three years at 11,000 tons although home consumption has grown.

Imports, in fact, of natural indigo have increased by 31 per cent in quantity and 27.7 per cent in value. Exports, which cover 70 per cent of imports, have remained, in quantity, practically unchanged but their value has diminished by 20 per cent. Hydrogen peroxide (100 vol.) has increased by 20 per cent, to 60,000 tons. Exports have absorbed half the increased production.

Development of production and consumption of sodium perborate was notable: an increase of the order of 35 to 40 per cent has occurred. Synthetic detergents have shown important progress. By contrast there has been a diminution in production of classical soap products. Ammonia production was marked by an 8.6 per cent increase; that of urea by 37 per cent, total production of which was 81,000 tons corresponding to an increase of 3.7 times that of 1955 production. Methyl alcohol production remained unchanged. Calcium carbide production showed a decrease of about 4 per cent, as a result of production of acetylene from methane. Output of tartaric acid, which is subject to variation in primary disposable extracts of vinasse (distiller's wash) also showed a fall from 7,000 tons in 1955 to 6,000 tons in 1956 due to a small grape harvest.

Table 4

Italian Chemical Products

(in millions of tons)

	1954	1955	1956
Hydrochloric acid 20/21	92	119	125
Sulphuric acid (100%) ...	1,824	1,943	2,054
Tartaric acid	7	7	6
Hydrogen peroxide (100 vol.)	4	5	6
Methyl alcohol (crude) ...	24	32	32
Ammonia (100%) ...	361	419	455
Calcium carbide ...	253	278	267
Organic dyestuffs ...	11	11	11
Formaldehyde (100%) ...	13	15	14
Sodium carbonate (100%)	482	472	477
Caustic soda (100%) ...	256	238	254
Copper sulphate ...	84	100	85
Urea	32	59	81
Carbon (coke)	3,667	3,948	4,350
Tar	151	169	175
Benzole (crude) ...	30	35	38
Plastics materials ...	78	99	115

Sodium triphosphate production and imports are of interest. Imports increased by 3.5 times those of 1955.

Artificial fibres and synthetics production continued to rise. Nylon was the most important of the synthetic fibres and production of polyamides in 1956 was still further increased (49.4 per cent) and was almost double the 1954 production.

Growth of polyvinyl fibres of which consumption has shown a marked advance was more modest.

Polyester fibres (of the Terylene type) are still in the early stages, but the outlook is favourable. Italian production of 8,250 tons last year was appreciable, but was certainly passed by UK and Japanese production.

Titanium oxide production last year in Italy was about 14,000 tons which represents a 70 per cent increase over 1955 output. Permission was granted to export 4,500 tons against imports of

Table 2

Distribution of Phosphate Fertilisers

	Germany	Belgium	France	UK	Italy
Super phosphate	14.7	12.9	26.2	49.3	85.9
Super concentrated	—	6.2	2.8	11.2	2.8
Dephosphorilated slags	61.4	57.0	44.8	23.3	3.1
Natural phosphates	3.4	—	13.8	6.9	—
Various types	6.8	18.4	4.1	—	—
Compounds (P_2O_5)	13.7	5.5	8.3	9.3	8.2
	100	100	100	100	100

Table 3

Distribution of Nitrogenous Fertilisers

	Germany	Belgium	France	UK	Italy
Ammonium sulphate	20.0	53.4	18.4	71.7	47.5
Ammonium nitrate	51.1	41.3	49.7	19.9	16.0
Sodium nitrate	0.1	—	1.4	—	—
Calcium nitrate	5.9	—	10.0	—	18.8
Calcium cyanamide	10.9	2.6	2.4	—	11.4
Various	0.8	0.1	3.6	—	2.2
Compounds (N)	11.2	2.6	14.5	8.4	4.1
	100	100	100	100	100

Table 5

Italian Production of Artificial Fibres and Synthetics

(in millions of quintals)

	1954	1955	1956	1955–1956 %
Artificials				
Cellulosics	1,294.5	1,355.1	1,520.5	+12.2
Caseins	35.6	30.3	33.9	+11.9
Synthetics				
Polyamides	34.4	48	71.7	+49.4
Polyvinyls	8.3	7.7	8.5	+10.3
Polyesters	—	0.5	2.3	—
	1,372.8	1,441.6	1,636.9	—

2,400 tons. Production of lithopone remained constant at 1,900 tons. Similarly, chrome pigments and those of lead and zinc oxide, were maintained at 1,200 tons. Iron oxide production was estimated at about 2,700 tons. Consumption of large quantities of iron pigments was influenced by the heavy imports, principally from Germany, that have been estimated at 3,000 to 3,500 tons. The position of other pigments appeared to be stable although ultramarine blue showed constant regression.

It was stated by Sig. Morandi that it was difficult to give sufficiently accurate production figures for plastics materials. Having regard to the criteria adopted in preceding years, Italian production in 1956 is estimated at 115,000 tons, an increase of 16.1 per cent compared with 1955. The increase was somewhat less than in previous years (53 per cent in 1954 and 27 per cent in 1955). The most important development was the production of polystyrol-based resins, of polythene and of polyvinyl chloride. Also of interest was the increase in melamine resins.

Success in macromolecular chemistry accelerated petrochemical development of the olefines, ethylene, propylene, butylene, etc. The heavy fractions have been used to produce hydrogen and acetylene. Among products originating from petrochemicals are polythenes and polypropylenes, while butadiene, has for some time dominated synthetic rubber production. At Ravenna, there will soon be a large factory producing synthetic rubber with a 30,000 ton per year capacity.

Italian imports of plastics materials and in particular, polymerised thermoplastics increased by 50 per cent in quantity and 40 per cent in value. Italian exports have risen by 16 per cent in quantity and 19 per cent in value. In 1956, exports of essentially, it is believed, polyvinyl chloride and polystyrene, have been 3.3 times greater than imports.

Chemical industry greatly influences the Italian economy, Sig. Morandi reported. In considering this economy, account should be taken of the one international, political and economic factor which affects it—Little Europe, the six nations of the Common Market and Euratom, i.e. in addition to Italy, France, West Germany, Belgium, the Netherlands and Luxembourg. These five partners of Italy sent the largest share of chemical products to Italy in 1956, namely 44.3 per cent with West Germany having two-thirds of this share. In contrast only 16.6 per cent of Italian exports went to Little Europe which means that Italian chemical imports from these countries were 3.6 times as large as Italian exports to them.

Italy's chemical imports and exports are likely to even up when Italian chemists have developed better processes and products, and intensify their research efforts. The Common Market and provisions of OEEC will help Italian economy by offsetting the difficulties arising from customs agreements and import duties as exist at present.

National Week to Combat Corrosion

A NATIONAL anti-corrosion week is being organised during the period 14 to 19 October with the aim of 'inspiring industry to look afresh at corrosion and to do something about it'. A convention is to be held at Central Hall, Westminster, London on 15 and 16 October, and an exhibition, to open on 15 October at the Royal Horticultural Hall, London, will, it is claimed, be the largest of its kind ever devoted to anti-corrosion products and services. Sponsors are '*Corrosion Technology*'.

Will

DR. LESLIE HERBERT LAMPITT, director and chief chemist of J. Lyons and Co. Ltd., past president of the Society of Chemical Industry, who died on 3 June last, left £37,099 18s 2d gross, £31,271 4s 7d net value. (Duty paid £5,227.)

British Petroleum Form Department for Petrochemicals

A NEW department with responsibility for petrochemicals is being established by the British Petroleum Co. Ltd., Britannic House, Finsbury Circus, London EC2, in view of BP's increasing interest in this field. The department will be a separate organisation from the company's refineries and technical department and will be headed by Mr. D. G. Smith as general manager, with D. A. Howes as assistant general manager.

D. G. Smith general manager of the new department

The formation of the petroleum chemicals department will be accompanied by some changes in the refineries and technical department, including the appointment of Mr. M. A. L. Banks as general manager, following the appointment of Mr. C. E. Separing as a director of BP Trading Ltd. Mr. S. E. Adey is to be deputy general manager and assistant general managers will be Mr. J. Moffat, responsible for UK and continental refineries, and Mr. D. W. K. Barker who will be responsible for eastern and Commonwealth refineries. Mr. P. Docksey is to be co-ordinator research and development.

Conference Planned on Mass Spectrometry

THE mass spectrometry panel of the Hydrocarbon Research Group, Institute of Petroleum, is to collaborate with committee E-14 of the American Society for Testing Materials in a conference now being planned to take place in London during September 1958. Sessions will be devoted to the following topics: high resolution mass spectrometry, new instruments and techniques, the mass spectrometry of solids, mass spectrometry as applied to fundamental problems in physics and chemistry.

Further details will be announced later.

Official Opening of New Instrument Venture

ALTHOUGH production started in April, the official opening of the new factory of Optica United Kingdom Ltd. at Team Valley Trading Estate, Gateshead on Tyne 11 took place only recently. Mr. H. Bueckert, chairman of Optica s.p.a. of Milan, and Mrs. Bueckert were present at the ceremony. The new company, a joint venture between Optica Milan and Joyce, Loebl and Co. Ltd., Newcastle upon Tyne, is producing recording UV spectrophotometers, direct-reading spectrographs and other spectrographic and industrial instruments and automatic controls. Mr. Herbert Loebl and Mr. R. H. Joyce, are the joint managing directors.

Table 6

Production of Certain Chemicals in Europe and the US

	Fertiliser[1]							
	Nitrogenous (as N)	Phosphates (as P_2O_5)	Sulphuric acid (100%)	Hydrochloric acid (100%)	Sodium hydrochloric (100%)	Sodium carbonate (100%)	Calcium carbide	Organic dyes
Italy								
1955	315	444	1,943	40	238	472	278	11
1956	345	456	2,054	—	254	477	267	11
France								
1955	360	700	1,472	226	256	724	249	14
1956	400	743	1,535	239	293	783	262	15
Germany								
1955	745	535	2,263	—	555	983	822	—
1956	752	498	2,812	—	593	996	881	—
UK								
1955	304	330	2,129	—	—	—	—	—
1956	316	363	2,270	—	—	—	—	—
US								
1955	1,738	2,212	14,278	763	3,537	4,445	793	—
1956	2,033	2,252	14,580	825	3,790	4,590	910	—

[1]Agricultural season ended 30 June of year indicated.

Analytical Reagent for Determination af Palladium

DETERMINATION of palladium using diallydithiocarbamidohydrazine as analytical reagent and separation from Nickel is described by K. P. Sen Sarma, of the University College of Science, Calcutta (*Science and Culture*, 1957, **22**, No. 11, 635). Pd-compound is precipitated quantitively from hot solution at pH 3.1–4.5, in presence of citrate, using the above reagent. The brown compound formed has been analysed and found to have the constant composition $Pd(C_8H_{12}N_4S_2)\ H_2O$, and directly weighable in a Gooch crucible.

From a solution of palladium and nickel with pH adjusted to 3.1–4.5, palladium was precipitated hot with an alcoholic solution of the reagent and the filtrate separated in a Gooch, washed with hot water and finally acetone, dried at 105°C. and weighed. Nickel was estimated by the same reagent as described by N. K. Dutt and K. P. Sen Sarma (Annal. *Chem. Acta*, 1956, **15**, 21).

Palladium, according to Sen Sarma, is precipitated quantitatively also in the presence of other cations using this complexone before precipitation. Efficiency of the reagent is stated to be comparable to dimethylglyoxime.

1958 Grants for Chemistry Research

GRANTS for the assistance of research in all branches of chemistry are awarded by the Research Fund of the Chemical Society. About £700 a year is available for this purpose, and applications should be made by 14 November 1957. Applications from Fellows will receive prior consideration. Forms and regulations may be obtained from the general secretary, Chemical Society, Burlington House, Piccadilly, London W1.

Shell's Improved Lithium-Based Greases

RECENT work at Shell's Thornton Research Centre, near Chester, has led to improvements in the multi-purpose properties of lubricating greases based on lithium 12-hydroxy stearate, marketed under the Shell Alvania brand. The products have been improved in particular with respect to the protection they afford against moisture corrosion in bearings, and in their working lives at high temperatures.

Lithium 12-hydroxy stearate soap in a grease has properties which include great mechanical and high temperature stability, high melting point, excellent resistance to water, long shelf life and resistance to drying out and hardening in service. The new greases contain a new powerful corrosion inhibitor which confers outstanding anticorrosion properties even in the presence of large quantities of water. Oxidation stability of the greases, under both working and static storage conditions, has also been considerably improved so that they can now be used at higher working temperatures than could the earlier Shell Alvania greases or for considerably longer periods at the same working temperatures.

New Plant for Hydro-Refining of Crude Benzoles

THE simplified flow diagram below shows the working of the new plant of Newton Chambers and Co. Ltd., Thorncliffe, near Sheffield, for the hydrorefining of crude benzoles, naphthas and other hydrocarbon oils. The process, developed by the Coal Tar Research Association, is being commercially developed by Newton Chambers in agreement with the association, as stated in CHEMICAL AGE, 3 August, p. 179.

Crude benzole is transferred from storage to the plant by means of the pump shown and is pumped through the preheater to the evaporator, where it is vaporised into the gas stream under carefully controlled temperature conditions. The hydrogenation gas is compressed from its source and introduced into the evaporator along with the crude benzole after receiving a suitable degree of preheat in furnace 1.

Evaporator Conditions

Conditions in the evaporator are carefully controlled to enable the residues fraction, consisting largely of the wash oil 'fronts' present in the crude benzole to be removed as a liquid residue.

The gas stream, now enriched with that fraction of crude benzole required to be hydro-refined is then finally preheated in furnace 2, to the desired reaction temperature before introduction into the converter. The heat content of the gas and refined benzole vapours is then utilised to evaporate and preheat the crude benzole, as indicated, before final cooling of the gas and condensation of the benzole vapour in the condenser.

No matter whether the hydrogenation gas be hydrogen, straight coal gas or modified forms of the latter, it is generally more economic to recycle the greater proportion of the tail gas, after separation of the benzole condensate, by re-introduction into the plant via the tail gas booster, as indicated.

The heating of the two furnaces can be carried out using any type of fuel. Where the return of the tail gases to a works' (gasworks or coke ovens) foul main is not permissible, then tail gases may be utilised for this purpose.

When the process is designed to use coal gas as the hydrogenating medium, the plant will generally be designed to work at a pressure of the order of 450 lb. p.s.i. and at temperatures of the order of 750°F. When desulphurisation is to be carried out using hydrogen, on the other hand, the refining can be carried out at much lower pressures.

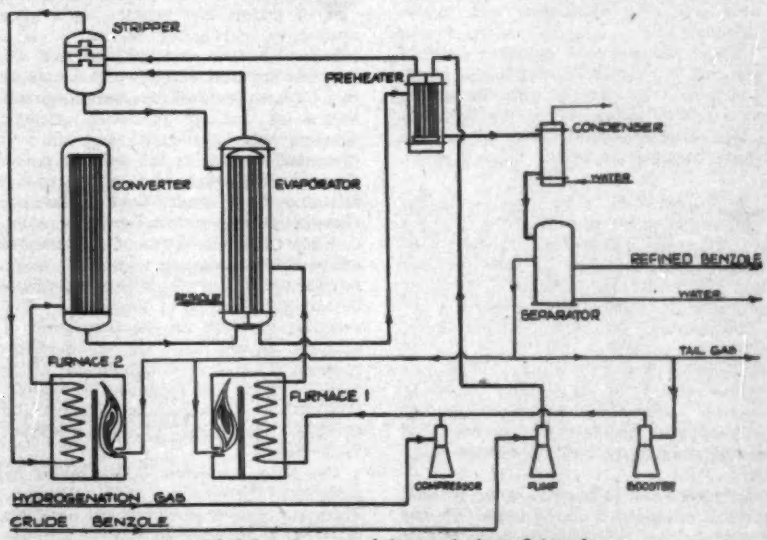
The process is also available for crude naphthas, with special additional features (patents applied for). By this means, naphthas, which are water-white, colour stable and sweet smelling, can readily be produced.

Conference on Textiles Flammability

A ONE-DAY conference on 'The flammability of textiles' will be held by the Manchester and district section of the Textile Institute at the British Rayon Research Association on 15 October, starting at 9.45 a.m.

Papers will be presented by Mr. D. I. Lawson (Fire Research Station) on 'The contribution of apparel and household textiles to fire accidents'; Mr. F. Ward (Courtaulds Ltd.) on 'Standard testing methods'; Dr. T. Morton (Courtaulds Ltd.) on 'Factors which influence the flammability of fabrics'; and Mr. J. S. Ingham (Marks and Spencer Ltd.) on 'The implication of flameproofing'.

Professor C. S. Whewell, of Leeds University, will sum up the conference.



Simplified flow diagram of the new hydro-refining plant

★ Following the recent London conference on the use of chemical additives in food, extensively reported in Chemical Age, Alembic is interested to learn from Pfizer Ltd., Folkestone, that Biostat, their antibiotic preparation, based on a formulation of oxytetracycline in a citric acid base, for the control of bacterial spoilage is being supplied to overseas markets in sachets of Metathene polythene-coated cellulose film.

The first consignment is destined for use in the whaling industry in the Argentine. A special whaling formulation of Biostat, it will be used to retard bacterial spoilage of whale carcasses between the time of killing and processing—giving the prospect of increasing the industry's yield by anything up to 25 per cent.

★ A recent special issue of *Ciba Review* marked a noteworthy interruption of a tradition, by which each issue presents a historical or technical topic, without promotional implications. The special issue in question (No. 120) is devoted to a new class of dyes marketed under the name of Cibacron.

These dyes are said to involve 'an entirely new chemical principle that will place the chemistry of dyeing cotton and regenerated cellulose fibres on a new foundation'.

Cibacron dyes are able to form a chemical bond with cellulosic fibres. Chemical reaction with the fibre only occurs at elevated temperatures (160–212°F./70–100°C.) and in the presence of alkalis. The link of dye and fibre is permanent and the dye can only be removed together with fibre particles. As evidence of this chemical bond, it is stated that a diazotisable cleavage product of the dye remains bound to the fibre even after discharging with hydrosulphite.

These new dyestuffs represent years of research into the dyeing of cellulosic fibres, which has run parallel with the similar long-term investigations of the ICI dyestuffs division that culminated in the recent introduction of the Procion range.

★ There was some disappointment earlier in the year when the brochure on the group's industrial activities, published by the Distillers Co., did not give any idea as to the turnover of industrial products as compared with whisky and gin.

In his annual statement, Sir Henry Ross, chairman, confirmed that 75 per cent of total profits came from whisky and gin and 25 per cent from the group's industrial interests. This means that something like £5,500,000 of Distillers' total income now derives from petrochemicals, biochemicals, etc.

Alembic was interested to learn that there is no question of the industrial side being subsidised by profits on whisky or gin. Developments in the chemical and plastics field is financed from earnings from those industries, which have consistently been ploughed back. Alembic wonders how long it will be before the group's industrial interests are contributing the greater part of total profits and hazards a guess at about 1965.

★ Alembic is not bursting into verse himself, but could not resist reproducing these lines penned in tribute to Mr. H. J. Elliott, founder director of H. J. Elliott Ltd., on his 80th birthday. The author, Mr. L. Cheinin, describes himself as a valued friend and customer of Mr. Elliott.

'To Mr. H. J. Elliott
My best congratulations!
And drink to him a whisky tot
To join the celebrations.

Indeed he is a young wise sage
Who wears his years so lightly—
To his achievements the age
Bows in respect politely!

To him his work was like a child
That never gives one leisure,
He pioneered in the "wild"
And has unearthed a treasure.

He toiled to "tame" all forms of glass
To serve the growing science,
And so has given all of us
The fruits of his reliance.

And now he sees his child full grown
Into an E-MIL giant—
Who leads in field and holds his own
Determined and defiant!

I hope you will not mind too much
These humble panegyrics—
I only very seldom touch
Strong liquor and the lyrics

But on this DAY I'll have a fling
My feelings glowing mellow
And with you I want to sing
"FOR HE IS A JOLLY GOOD FELLOW!"'

★ Apart from the normal difficulties of finding and maintaining a good abstracting intelligence service, it is a sobering thought that at least half the scientific literature of the world cannot be read by more than half the research workers because of language difficulties. Alembic wonders how much time and effort is dissipated by chemists and others in pursuing a particular line, when all the time a full account of similar work undertaken elsewhere already exists in foreign literature.

A new Unesco book tells of the strenuous efforts being made and what more might be done to surmount the language obstacles in spreading scientific knowledge. The everyday problems in the translation of scientific papers, with the manifold intricacies of words, form a main part of the book 'Scientific and Technical Translating' (United Nations Educational, Scientific and Cultural Organisation, 19 Avenue Kleber, Paris, 20s).

The book represents collaboration by more than 200 persons of 21 countries. There are sections on the special problems that arise in reference to Russian, Chinese and Japanese and the book contains some interesting speculations on concentrating on, or adapting, existing languages for universal use.

★ Another company with its origins in the US, seeking to set up a branch factory in Scotland, is Beckman Instruments Ltd., a subsidiary of Beckman Instruments Inc., California. They have been negotiating for a 20,000-acre site at the new town of Glenrothes, Fife. Manufacturing range will include precision rheostat potentiometers.

Dr. Wilbur Kaye, the US company's director of research, has recently been visiting this country after attending the European molecular spectroscopy conference. While here he gave two lectures on the use of the near infra-red region in spectrophotometry at the London showrooms of Baird and Tatlock, the company's agents. A number of instruments were specially imported for the demonstration including infra-red spectrophotometers and a DK-2 spectroreflectometer. Mr. E. G. Thompson, technical sales manager for the London firm, also spoke at these sessions.

★ Is the mathematician likely to replace the chemist? In certain respects the answer must be 'Yes' for the very modern advent of analytical instrumentation is solving rapidly and with relatively unskilled labour a number of problems that have previously taken trained chemists a considerable time to answer. But it is too much of a generalisation for the BBC, in a recent announcement of a Third Programme discussion, to say that 'before long the chemist will have no need to experiment at all, since computation—with the aid of electronic computers—will predict results without his having so much as to touch a test-tube'.

Whatever the success of the mathematician's work, his results can only be tested by experiment. The days of the empiricist are not over yet.

★ The US chemical industry's concern at the rate of foreign imports led to the industry's request for better anti-dumping protection as reported last week, p. 296. At present the US is an excellent market for foreign chemicals, and imports in 1956 reach ed a record level of $274 million. The UK share of that total was £8,628,053. Imports for 1957 are expected to equal at least, if not surpass, the 1956 level. Many US manufacturing concerns, faced with higher costs and declining profit margins are looking more favourably at imported chemicals.

This trend of falling margins is, of course, also hitting US chemical companies. According to *Baird Facts*, the monthly digest of Baird Chemicals, chemical industry circles in the US remain confident, predicting that the customary autumn upturn in business will make 1957 an excellent year. Major price changes are not expected until 1958.

Alembic

Acetylene—Production and Uses

Part 2: Factors affecting the choice of process

By
S. A. MILLER
and
J. A. TEBBOTH
of
British Oxygen Research and Development Ltd.

ACETYLENE has been commercially available for some 60 years, but for the first 30 years at least its main outlets were for illumination, and for the welding and cutting of metals; the only large-scale use in chemical synthesis was the preparation of acetaldehyde, which was developed during the first World War. Whilst the use of acetylene as an industrial gas is still expanding, and quite rapidly in certain parts of the world, the rising demand for acetylene is mainly based on a great variety of large-scale synthesis of chemicals, which have been developed in the last two or three decades. More acetylene is used for chemical synthesis today than is used as an industrial gas. The growth of acetylene products, both in variety and in scale, is continuing, and shows every sign of being maintained for a considerable period to come.

Acetaldehyde. Hydration to acetaldehyde is catalysed at 94–97°C. by mercuric sulphate, which is (in more recent operation) generated *in situ* from ferric sulphate and mercury, the solution being continuously circulated through a separate vessel where the ferrous sulphate is re-oxidised with nitric acid. The hydration possibly proceeds through the intermediate formation of the unknown vinyl alcohol, which would be the enolic form of acetaldehyde:

$$CH{:}CH + H_2O \rightarrow CH_2{:}CH.OH \rightarrow CH_3.CHO$$

The process is still operated in a number of countries, including US and Germany, but it never became firmly established in Britain.

Alternative Sources

There are two important alternative sources of acetaldehyde, the first being the oxidation of ethanol (whether made by fermentation or by hydration of ethylene), whilst the second is the direct oxidation of lower hydrocarbons to mixtures of aldehydes, ketones and other oxygenated products. The comparative economics of the various processes depends on local conditions, and it is impossible to predict whether further growth in the demand for acetaldehyde will be reflected in further demand for acetylene.

Trichloroethylene. A well established outlet is the reaction of acetylene with chlorine; passing through a 0.01 per cent solution of anhydrous ferric chloride in the product at 80–90°C. gives tetrachloroethane, which is then dehydrochlorinated either with a lime slurry at 102°C. or over a barium chloride on charcoal catalyst at 230–320°C., to give trichloroethylene, a degreasing solvent and analgesic (Trilene):

$$CH{:}CH + 2Cl_2 \rightarrow CHCl_2.CHCl_2 \rightarrow CHCl{:}CCl_2 + HCl$$

In addition, trichloroethylene is further chlorinated in presence of 0.2–0.3 per cent of ferric chloride at 80–90°C. to give pentachloroethane, and this is dehydrochlorinated with milk of lime at 110°C. and 200 mm., to give tetrachloroethylene (perchloroethylene), which is a dry-cleaning solvent:

$$CHCl{:}CCl_2 + Cl_2 \rightarrow CHCl_2.CCl_3 \rightarrow CCl_2{:}CCl_2$$

Trichloroethylene in the US alone is at the 150,000, and perchloroethylene at 80,000 tons/annum level. There is a newer process for the latter starting from propane instead of acetylene.

Vinyl Chloride. Vinyl chloride is now a really big tonnage chemical, having grown in a quarter of a century from nil to something over 500,000 tons per annum on a world basis. Most of it is made from acetylene and hydrogen chloride directly, by passing over a catalyst such as barium and mercuric chlorides on activated charcoal at 120–180°C.:

$$CH{:}CH + HCl \rightarrow CH_2{:}CHCl$$

There is an important alternative route from ethylene, which is chlorinated in presence of ferric chloride and dehydrochlorinated catalytically:

$$CH_2{:}CH_2 + Cl_2 \rightarrow CH_2Cl.CH_2Cl \rightarrow CH_2{:}CHCl + HCl$$

The HCl liberated can be used for combination with acetylene as shown above, thus giving a combined route to vinyl chloride.

Vinyl Acetate. Total production of vinyl acetate in the US, Canada, Germany, Britain and elsewhere is now about 150,000 tons per annum. The most important route is from acetylene and acetic acid, frequently by passing the vapours over a charcoal supported catalyst such as zinc acetate at about 180–210°C.:

$$CH{:}CH + CH_3.COOH \rightarrow CH_3.CO.O.CH{:}CH_2$$

There is a commercial route not based on acetylene, whereby acetaldehyde and acetic anhydride are reacted to give ethylidene diacetate, which is then converted into vinyl acetate and acetic acid by a catalyst such as p-toluenesulphonic acid:

$$CH_3.CHO + (CH_3.CO)_2O \rightarrow CH_3.CH(O.CO.CH_3)_2 \rightarrow CH_2{:}CH.O.CO.CH_3 + CH_3.COOH$$

Ethylidene diacetate was at one time itself made from acetylene and acetic acid (2 molecules) in the liquid phase, and converted into acetic anhydride and acetaldehyde, but this process is no longer being developed.

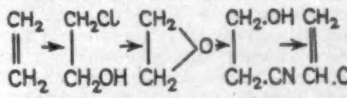
Outlets for vinyl acetate are continuously expanding, both in the form of polyvinyl acetate emulsions in paints, adhesives, etc., polyvinyl alcohol, polyvinyl formal (e.g. in wire coating enamels) and polyvinyl butyral (e.g. in safety glass interlayer), and many copolymers.

Vinyl Esters. Vinyl esters of many carboxylic acids have been made and polymerised or copolymerised with vinyl acetate, vinyl chloride, etc. The esters have been made either directly from acetylene, or by ester interchange with vinyl acetate (using mercury sulphate catalysts). Specialty uses are being developed in certain cases, for example, for vinyl stearate and vinyl propionate, and esters (other than the acetate) may grow into commercially significant products.

Acrylonitrile. This, also known as vinyl cyanide, first achieved commercial importance as a comonomer with butadiene in the production of oil-resistant synthetic rubbers. This is still an important use. Polyacrylonitrile itself, and copolymers in which acrylonitrile is a major constituent, have become the basis of numerous fibres (Dynel, Orlon, Chemstrand, Acrilan, etc.), in the last 10 or 12 years, and the production capacity for acrylonitrile in the US alone already exceeds 100,000 tons per annum.

US Acrylonitrile Process

Until recently manufacture in the US was mainly based on ethylene, through ethylene oxide and cyanohydrin:



Now, however, a large proportion is being made in the US, as it has been in Germany throughout, from acetylene and hydrogen cyanide, which are reacted at 80–90°C. in an acidic solution of cuprous chloride in ammonium, sodium or potassium chloride:

$$CH{:}CH + HCN \rightarrow CH_2{:}CH.CN$$

Acetylene Black. Acetylene is an endothermic compound and on heating it decomposes into its elements with the liberation of 54.1 kcal. per mole. The carbon produced by a controlled decomposition has special electrical properties, and is mainly used for the production of dry batteries. Production is mainly in Canada (up to 10,000 tons per year), although during the war there was a production capacity of 18,000 tons per year at Piesteritz in Eastern Germany.

Vinylacetylene. Treatment of acetylene with an aqueous catalyst containing cuprous chloride and ammonium chloride (or other salts) in acid solution at 60–80°C. gives a dimer of acetylene, vinylacetylene,

together with smaller proportions of divinylacetylene and higher polymers:

$$CH \vdots CH + CH \vdots CH \rightarrow CH_2{:}CH.C \vdots CH \rightarrow CH_2{:}CH.C \vdots C.CH{:}CH_2$$

Chief commercial interest of vinylacetylene is its hydrochlorination to 2-chlorobutadiene (chloroprene), polymerisation of which gives the synthetic rubber Neoprene:

$$CH_2{:}CH.C \vdots CH + HCl \rightarrow CH_2{:}CH.CCl{:}CH_2 \rightarrow -[CH_2.CH{:}CCl.CH_2]_n$$

Neoprene has been made by Du Pont for 20 years, and the annual production now approaches 100,000 tons per annum. The first plant for Neoprene production in the UK is now being constructed in Northern Ireland.

Pyridine. Acetylene and ammonia react at 350–400°C. over catalysts such as cadmium tungstomolybdophosphates on fullers earth to give picolines and 2-methyl-5-ethylpyridine:

$$3C_2H_2 + NH_3 \rightarrow C_5H_4N.CH_3 + H_2$$
$$4C_2H_2 + NH_3 \rightarrow C_5H_3N(CH_3)(C_2H_5)$$

Under other conditions, ethylamine, acetonitrile, and pyridine itself can be among the products. Reilly Tar and Chemical Corporation have announced the multi-thousand ton per year production of pyridine and alkylpyridines based on acetylene. It should be noted that methylethylpyridine has been made commercially in the US for many years by a somewhat parallel reaction of ammonia and paraldehyde.

Butynediol Production

Butynediol. All the processes hitherto considered use the acetylene at atmospheric pressure or only at slight super-atmospheric pressures. At higher pressures acetylene is readily initiated to decompose explosively, and detonation can be built up, in which the pressure rise is some 40 to 50-fold and the detonation travels at over 2,000 metres per second. It was in Germany during the early part of the war that processes were developed in which large-scale production could be based on acetylene under pressure, and the explosion hazards kept under control.

The principal use developed was the reaction between acetylene and formaldehyde, which takes place at 5 atm. pressure and about 100°C., in presence of a catalyst consisting of cuprous acetylide supported on silica gel, to give butynediol:

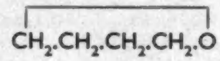
$$CH \vdots CH + 2CH_2O \rightarrow CH_2OH.C \vdots C.CH_2OH$$

The butynediol was then hydrogenated to butanediol, which was dehydrated to give butadiene for the production of synthetic rubber:

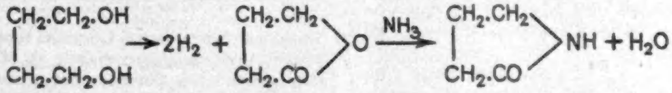
$$CH_2OH.C \vdots C.CH_2OH + 2H_2 \rightarrow CH_2OH.CH_2.CH_2.CH_2OH \rightarrow 2H_2O + CH_2{:}CH.CH{:}CH_2$$

The Ludwigshafen plant was built to operate at a production capacity of 30,000 tons per annum of butynediol, but since the war production has been limited to a small fraction of this because the occupying authorities limited the production of synthetic rubber.

This route is not competitive for the production of butadiene with processes based on petroleum. Reppe and his co-workers, however, developed a vast range of chemical intermediates based on this reaction of acetylene and formaldehyde, and products included new solvents, nylon intermediates, medicinals such as sulphadiazine, Atabrin, etc. Each of the three stages given above in the preparation of butadiene, also yields a versatile intermediate; from acetylene and formaldehyde is also obtained propargyl alcohol, $CH \vdots CH.CH_2OH$; in the hydrogenation of butynediol there can also be obtained butenediol, $CH_2OH.CH{:}CH.CH_2OH$; and the dehydration of butanediol can proceed via tetrahydrofuran:

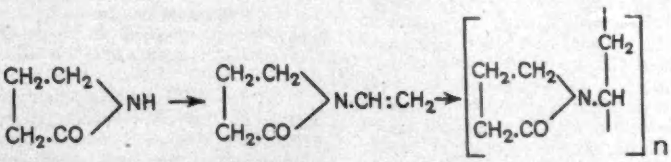


It is impossible to predict how many of these wartime developments of the ethynylation reaction will be revived and developed into really large-scale uses. One chain of reactions has been taken up on a large scale by General Aniline and Film Co., US, and was originally a sequence whereby the Germans produced a synthetic blood plasma substitute. Vapour phase dehydrogenation of butanediol at about 200°C. over a copper catalyst gives butyrolactone, treatment of which with ammonia under pressure produces 2-pyrrolidone:



Butyrolactone is now of some interest in the UK as an intermediate in production of a selective weedkiller. Pyrrolidone has itself been polymerised, to give polypyrrolidone, $NH_2.[CH_2.CH_2.CH_2.CO.NH]_n.CH_2CH_2.CH_2.COOH$. This is a nylon-type polymer, and could be designated as nylon 4 (the usual nylon being nylon 66, and Perlon being nylon 6).

Vinylpyrrolidone. The main interest of pyrrolidone so far, however, is its subjection to another reaction with acetylene under pressure, this time 10–20 atmospheres, in presence of an alkali catalyst at 115–125°C. This gives vinylpyrrolidone, which is a water-soluble monomer, and which is polymerised in aqueous solution by ammonia and hydrogen peroxide:



Polyvinylpyrrolidone is a very interesting material, in that it is compatible with the proteins of blood, and also it complexes with many materials such as keratin, penicillin, iodine, etc. In addition to its medicinal uses, it is finding outlets in the cosmetic industry, in colour photography, in textiles as a dying auxiliary aid, as a vat-dye-stripping agent, and in other fields. Copolymers are also under investigation, particularly in the synthetic fibre field.

Vinyl Ethers. Another acetylene pressure reaction which was developed by Reppe and his co-workers to full-scale production in Germany during the war years was with the lower alcohols. Addition of acetylene to these lower alcohols takes place at about 160°C. at 20 atmospheres (in the case of methanol or ethanol) or 5 atmospheres (in the case of n- or iso-butanol), potassium hydroxide being the catalyst:

$$C_nH_{2n+1}OH + CH \vdots CH \rightarrow C_nH_{2n+1}.O.CH{:}CH_2.$$

It should be noted that the lower vinyl ethers can also be made by catalytic decomposition of acetals, and some is being made in this way.

Polymers obtained from vinyl ethers were used in Germany during the war years as adhesives, artificial resins, leather additives, for textile treatments, and for oil additives. Most of these uses were, however, substitute uses for preferable materials. Polymethyl vinyl ether is water soluble, but gels on warming above 35°C.; this property has been exploited for speeding up rubber latex dipping processes. Recently a higher molecular weight polymer of ethyl vinyl ether has been developed in America, and this has certain special features which may make it useful in specific adhesive fields.

In addition, certain new uses appear to be arising for vinyl ethers as chemical intermediates. Although vinyl ethers have not been an appreciable outlet for acetylene outside wartime Germany, this position may alter in the coming years.

Vinyl ethers of higher molecular weight alcohols, such as hydrogenated spermoil, abietyl alcohol, octadecyl alcohol, tetrahydro-2-naphthol, etc., were also made in wartime Germany, by vinylation at normal pressures. Little has been heard of their use since the war.

A resin called Koresin was also made in wartime Germany, and found an important outlet as a tackifier for synthetic rubber. The compound was originally described as a low polymer of the vinyl ether of t-butyl phenol; actually it is more likely to be a condensation of the type, $CMe_3.C_6H_3(OH).CHMe.[C_6H_2(OH)(CMe_3).CHMe]_n.C_6H_3(OH).CMe_3$ (where n = 3–7). Koresin was a necessity in the fabrication of tyres from German wartime Buna rubber, but there does not seem to be a market for it now.

Acrylic Esters. Reppe also embarked on a completely new field of chemistry involving the reactions of acetylene with carbon monoxide, characterised by the introduction of new catalysts in the form of the carbonyls of cobalt, nickel and iron. Thus in presence of ethanol, acetylene reacts with nickel carbonyl as follows:

$$CH \vdots CH + CO + C_2H_5OH \rightarrow CH_2{:}CH.COOC_2H_5.$$

The reaction being done in presence of an acid, the nickel is converted into a salt, and the reformation in a separate reaction

of nickel carbonyl was studied. A high temperature (170–180°C.), high pressure (30 atmospheres or more) catalytic process between equimolar carbon monoxide and acetylene was also worked out on a pilot scale. Recently Rohm and Haas in the US have developed an improved process, intermediate between Reppe's stoichiometric and catalytic processes. This promises to be competitive with the established routes to acrylic esters, which are based on ethylene oxide. Acrylic esters lead to valuable polymers, and are also important constituents as comonomers in a variety of copolymers.

Vinyltoluene (*Methylstyrene*). The direct reaction between benzene and acetylene to give styrene has never been worked out. Acetylene can, however, be made to react with toluene and other substituted benzenes (at ambient or reduced temperatures, in presence of catalysts such as mercuric sulphate), the product first obtained being from one molecule of acetylene with two of the toluene (etc.); the ditolylethane can subsequently be cracked in presence of steam at 550°–600°C. to give vinyltoluene (as a mixture of o- and p-isomers) and recover the excess toluene:

$$CH\vdots CH + 2C_6H_5.CH_3 \rightarrow CH_3.CH(C_6H_4.CH_3)_2 \rightarrow CH_3.C_6H_4.CH{:}CH_2 + C_6H_5.CH_3.$$

This process has been developed by the American Cyanamid Corporation, to a 20,000 ton per year plant. Future prospects of this process depend on a combination of economic factors (such as the relative prices of benzene and toluene, which for example are very different in America and Britain), and detailed advantages (such as higher softening point) of polyvinyltoluene as compared with polystyrene. The position is also complicated by the recent emergence of new modifications of polystyrene itself, and also of the Dow route to vinyltoluene (using ethylene), which, however, gives a different mixture of isomers (m- and p-).

Other Uses

Other products. German wartime production of ethylene by partial hydrogenation of acetylene is not a process which is likely to commend itself to post-war conditions anywhere.

The same is probably true in respect to the process for making acetone directly by hydration over a zinc oxide catalyst:

$$2CH\vdots CH + 3H_2O \rightarrow CH_3.CO.CH_3 + CO_2 + 2H_2.$$

This process was applied directly to a gas containing about 8 per cent of acetylene, obtained by the partial combustion of methane with oxygen; this is cheaper acetylene than the 100 per cent gas, but the process would have now to compete with processes based on propylene which is plentifully available in petrochemical operations.

A polymer of unusual electrical and thermal properties has been obtained by reacting carbazole with acetylene under 20 atmospheres pressure in presence of alkali and zinc oxide, and polymerising the vinylcarbazole.

The cuprous acetylide catalyst for the reaction between acetylene and formaldehyde cannot be extended to catalyse reactions between higher aldehydes or ketones with acetylene. Such reactions can, however, be brought about by different catalysts, usually alkali metal hydroxides in presence of particular organic solvents. Alkynols and alkynediols are obtained:

$$CH\vdots CH + R.COR' \rightarrow CH\vdots C.C(OH)RR' \rightarrow RR'C(OH).C\vdots C.C(OH)RR'.$$

These compounds have passed from the laboratory to the pilot stage in the US, and are finding uses as drugs (methylpentynol is the tranquilliser Oblivon), surface active agents, etc. A reaction of this class is a vital step in the multistage synthesis of vitamin-A, which is now in commercial operation.

Sodium acetylide, $NaC\vdots CH$, has been a tool in laboratory syntheses based on acetylene for many years, when it has usually been prepared by reacting acetylene with sodamide in liquid ammonia. A typical reaction of sodium acetylide is that with an alkyl halide or dialkyl sulphate to give an alkylacetylene (alkyne); this is one of the ways of making methylacetylene (propyne), the lowest homologue of acetylene. As yet there are no indications of full-scale uses in the offing for the alkynes.

A fascinating reaction uncovered by the Reppe school was the tetramerisation of acetylene to give cyclooctatetraene. A very great deal of interesting chemistry was uncovered both by Reppe and by subsequent workers in studying this compound; it can be converted into derivatives with benzene rings, such as phenylacetaldehyde, into open chain compounds, such as suberic acid, into derivatives of cyclooctane, and of bicyclooctane. As yet no industrial outlets have been discovered; its versatility, however, still strongly suggests that some outlets will arise at some future date.

There is a polymeric product, somewhat dehydrogenated, which is obtained from acetylene in presence of metallic copper at 250–300°C. and normal pressures. This has been called cuprene, even when most of the copper has been removed from the product. It is a phenomenally voluminous material (bulk density can be as low as 0.02 g./cc.), and many uses have been proposed, but not developed commercially.

Chemical utilisation of acetylene is thus based on a wide variety of products, some of which are very large tonnage products and still growing rapidly. In many cases acetylene has to share the market for a particular product with other basic raw materials, particularly ethylene; sometimes an acetylene route becomes obsolete, but this is a rarer event than a new acetylene synthesis being developed and upscaled. On the whole there seems every reason to expect the rise in demand for acetylene to continue for some time to come at much the same rate as has been operative in recent years.

Acknowledgement

We wish to thank the directors of British Oxygen Research and Development Ltd. for permission to publish these articles.

UK/Swiss Agreement on Inventa Process for Methanol and Formaldehyde

A NEW agreement signed with Inventa A.G., Lucerne, enables Head Wrightson Processes Ltd., Ship House, 20 Buckingham Gate, London SW1, to design and supply plants to the Inventa processes for the production of methanol and formaldehyde in the UK and Commonwealth, excluding Canada. Head Wrightson Processes state they can now offer a complete service for the provision of these plants, from design to final commissioning.

The technical and design information on the production of methanol from carbon monoxide and hydrogen which Inventa will pass to the company under this agreement is based on the experience of running an industrial scale plant at the works of an associate company in Switzerland over the past 15 years. A vital feature of this process is the special catalyst which has been developed by Inventa. Its special properties are said to include high production, long life, low sensitivity to poisons and easy storage. In addition the catalyst has the advantage of working at reasonably low temperatures which reduces the formation of unwanted by-products, such as methane, to a minimum.

A large methanol plant operating on the Inventa process is nearing completion in the US.

The information available on the production of formaldehyde by the oxydation of methanol is again based on actual operating experience gained by the Swiss company over the last 11 years.

The most common uses for methanol are in organic solvents, antifreeze compounds, fuel additives and as the raw material in the production of other chemicals. Besides its well-known use as a preservative, formaldehyde is used for many purposes such as in the plastics, resins, dyes, leather and paper industries.

In Johannesburg, South Africa and Sydney, Australia, Head Wrightson have subsidiary companies with facilities at their disposal for supplying plant and equipment for this process.

Oxygen Welding School at Birmingham

A NEW welding school was opened by British Oxygen Gases Ltd., on 12 August, which will provide welding and cutting instruction for employees of industrial firms in the Birmingham area.

The school, which is at the company's Midlands headquarters at Hockley, has permanent accommodation for nine students of gas welding, and two argon welding students. Included in its programme will be pipe welding courses of six weeks' duration, and general courses in both welding and maintenance. Gas welding and cutting blowpipes, straight line and profile cutting machines, and argon equipment have been installed. There are facilities for lectures and film shows.

The school has been built to replace one which was operated at Berkley Street, Birmingham, where about 100 students pass through each year.

New Drug Intermediate Commercially Available: 1, 2, 5, 6 – Tetrahydropyridine

A NEW intermediate, particularly for drugs, 1, 2, 5, 6–tetrahydropyridine, is now available on a commercial scale from Robinson Brothers Ltd., Ryders Green, West Bromwich, Staffs. Although several substituted 1, 2, 5, 6-tetrahydropyridines occur in nature in several natural alkaloids, e.g. arecoline and guvacine, the parent body has not up to now been readily available. In references (1, 2, 3, 4) to this chemical, different physical characteristics have been ascribed to it. Much of the following data on 1, 2, 5, 6-tetrahydropyridine has been ascertained in the laboratories of Robinson Brothers Ltd.

Alternative descriptions for 1, 2, 5, 6-tetrahydropyridine are: 1, 2, 3, 6-tetrahydropyridine and △ 3-piperidine. Molecular weight is 83.08.

Specification of the commercial material now available is as follows: Analysis shows that not less than 96 per cent is 1, 2, 5, 6-tetrahydropyridine, with not more than 1.5 per cent of piperidine and 1.5 per cent of pyridine.

The material distills at the start at not under 115.5°C. and 80 per cent at between 116-117.5°C. Specific gravity is 0.912-0.914. The material has a flashpoint of 61°F. and in colour is water-white to pale straw.

Similarity of 1, 2, 5, 6-tetrahydropyridine with piperidine is marked, the product being a clear liquid, with a similar odour and miscible with water. The chemical is 99.5 per cent pure. Boiling point as determined by Robinson Brothers is 116.8°C./75.3 mm.; specific gravity $^{20}_{4}$, 0.9131; refractive index $^{20}_{D}$, 1.4810; crystallising point —44.5°C.; and water azeotrope boiling point (47-48 per cent water) is 95.6°-95.7°C./747 mm.

Chemical Proportions

Chemical properties which have been investigated, indicate that the secondary amine group of 1, 2, 5, 6-tetrahydropyridine behaves very similarly to that of piperidine. It forms an acetyl derivative having a melting point about —3°C.(2), boiling point 117°C./19 mm.(2) and 230-233°C./760 mm.(4), and a refractive index $^{20}_{D}$ 1.4979(4), and a benzoyl derivative with melting point 60°-62°C., boiling point 113°C./0.15 mm.(2).

It can be alkylated to form 1-methyl and 1-ethyl 1, 2, 5, 6-tetrahydropyridine, which are available from Robinson Brothers. Quaternary salts are easily formed from these tertiary amines, as for example, 1, 1-dimethyl 1, 2, 5, 6-tetrahydropyridine iodide (m. pt., 274°-275°C.(2) (4).)

In a manner similar to piperidine, two molecules of 1, 2, 5, 6-tetrahydropyridine will react with one molecule of carbon disulphide to form a dithiocarbamate. On heating the dithiocarbamate sublimes at 160°-165°C. but on rapid heating melts at 180°C.(4).

The double bond of 1, 2, 5, 6-tetrahydropyridine can add on one molecule of bromine in acid solution to form salts of 3, 4-dibromopiperidine, such as the chloride (m. pt., 194°-195°C.) and bromide (m. pt., 207.5°-208°C. with decomposition). These salts are insoluble in acetone, sparingly soluble in ethanol, moderately soluble in methanol and very soluble in water (4). Owing to decomposition, 3, 4-dibromopiperidine itself cannot be separated.

Salts of 1, 2, 5, 6-tetrahydropyridine which have been prepared are the hydrochloride (m. pt., 194°-195°C.(4), 191°-193°C.(2), 188-189°C.(1) (3)), hydrobromide (m. pt., 161°-162°C.(4)), picrate (m. pt., 162°-163°C.(4), 161°-163°C (2)), aurichloride (m. pt., 141°-142°C.(1) (2)) and platinichloride (m. pt., 187°-188°C.(1) (2)).

On heating 1, 2, 5, 6-tetrahydropyridinium bromide to about 200°C. and 1, 2, 5 6-tetrahydropyridinium chloride to about 290°C., decomposition occurs with elimination of ammonium halide and the formation of a mixture of unsaturated hydrocarbons (4).

REFERENCES

(1) Renshaw, R. R., and Conn, R. C., *J. Amer. chem. Soc.*, 1938, **60.** 745.
(2) Davies, W. H., and McGee, L. L., *J. chem. Soc.*, 1950, 678.
(3) Lukes, R., and Pliml, J., *Coll. Trav. chim. Tchécosl.*, 1954, **19**, 1502.
(4) Robinson Brothers Ltd., hitherto unpublished.
(5) Paul, R., and Tchelitcheff, S., *Bull. Soc. chim. Fr. Docum.* (5), 1954, **21**, 982.

BS Committee on Food Colours

TECHNICAL committee FHC/11 on colouring matters for use in foodstuffs, set up by the British Standards Institution in June, has now been formed (see CHEMICAL AGE, 8 June, p. 972). It was established following an approach from the Ministry of Agriculture whose own food standards committee has for some time been working on the subject of colouring in foods.

With the exception of the representative of the Society of Chemical Industry all the organisations invited to be represented on the committee have now been named. The committee comprises:

T. R. Scott, chairman, A. T. Young, T. Irving and A. G. Kemp (Association of British Chemical Manufacturers), R. C. Spalding (Association of Public Analysts), Dr. J. B. M. Coppock (British Baking Industries Research Association), R. P. Winston (British Essence Manufacturers' Association and Flavouring Compound Manufacturers' Association), Miss E. M. Chatt (British Food Manufacturing Industries Research Association), Dr. J. Walker (British Pharmacopoeia Commission), Dr. A. L. Provan (BSI technical committee DA/6), Dr. R. T. Colgate (Cake and Biscuit Alliance), Dr. A. A. Houghton (Cocoa, Chocolate and Confectionary Alliance), J. King (Department of the Government Chemist), Dr. R. Allen (Food Manufacturers' Federation), W. M. Shortt and W. A. Godby (Ministry of Agriculture), Dr. H. Davis (Ministry of Health), Dr. A. J. Howard (Ministry of Health and Local Government, N. Ireland), Dr. K. R. Capper (Pharmaceutical Society), Dr. J. Allen (Society for Analytical Chemistry), Dr. H. W. Ellis (Society of Dyers and Colourists).

The constitution of the committee may be subject to alteration later.

Packaging Courses

Instruction courses in packaging, to be held in London, Manchester, Liverpool, Birmingham, Cardiff and Leicester, during the coming winter will include the packaging of corrodible articles, packaging in the chemical industry and the packaging of pharmaceuticals. Full details can be obtained from the Institute of Packaging, 80 Lancaster Avenue London SE27.

Agents Visit Silicone Works at Barry

Overseas agents of Midland Silicones Ltd., who recently toured the company's Barry works. L. to r. C. C. Caldwell, export manager, E. Figwer (Australia), Dr. V. Eigenmann (Italy), C. J. Baker, head of technical service, G. Bjorck (Sweden) left and G. Daasvatn (Norway) right, T. W. Watson, deputy head of technical service, H. Brennum (Denmark)

Overseas News

US COMPANIES BACK EXPANSION PLANS FOR MEXICAN SULPHUR INDUSTRY

SUBSIDIARY of the Gulf Sulphur Co., the Cia. de Azufre Veracruz, are to put five new wells into production shortly making a total of 10. Production is expected to reach from 800 to 1,000 tons daily by the end of September. An affiliate of Texas Gulf Sulphur Co., Cia. Explorada del Istmo, is reported to have almost doubled its production in July to 8,500 tons, compared with the output for June.

Of Mexico's sulphur production of 86,254 metric tons in July, Azufrera Pan Americana (Pan American Sulphur Co.) produced 59,161 metric tons. This company's net income in the first six months of this year totalled $1.6 million, which was more than double that of the same period in 1956.

Production by the Mexican Gulf Sulphur Co. and its affiliate, Azufrera Mexicana, was halted early this year when the company's dome was exhausted. Negotiations are under way with the Government for new areas.

Exports of sulphur from Mexico in July at 58,195 tons were lower than in June. Some 5,000 tons were bought for the local market, the greater part coming from Petroleas Americanos.

Pfizer Enter Petrochemical Field

The entry into petrochemicals of Chas. Pfizer & Co. Inc., the US domestic company of the international Pfizer organisation, has been announced in New York. The company has acquired Morton-Withers Chemical Co., Greensboro, North Carolina. Founded in 1931, Morton-Withers produce organic chemical specialities. Among major products are sulphonates useful as lubricating oil additives, and detergents, vinyl plasticisers, components for synthetic lubricants for jet engines, and polyester resins used in the manufacture of polyurethane foams and rubbers. Several new products which can be adapted to Morton-Withers' manufacturing facilities are already under study.

New Sulphuric Acid Plant for South Korea

The South Korean Ministry of Commerce and Industry has disclosed plans for an additional sulphuric acid plant to the Chung-hang smelter in Chungchong-namdo province. The plant, which will take 12 months to construct, will have a monthly capacity of 1,800 tons of sulphuric acid of 60° and will draw raw material from the nearby gold, silver, copper and lead ore smelter. The project will be backed by US International Co-operation Administration aid.

French Customs Duties Reimposed on Some Chemicals

The French Government has reimposed customs duties on the following goods (maximum *ad valorem* rate in brackets): dichloromethane (20); vinylidene chloride monomer (25); ethylene diamine and its salts (20); cyclic amino-aldehydes, cyclic amino-ketones and amino-quinones, their halogenated, sulphonated, nitrated and nitrosated derivates, salts and esters (25); diazo-azo- and azoxy-compounds (25); polymerised aminoplasts, whether modified or not (25); p.v.c. (30); cellulose acetate butyrate (20); propionate, etc. (20); plastics materials with a basis of cellulose esters (15); plastics materials with a basis of cellulose esters or other chemical derivatives of cellulose (30).

New Indian Method of Producing N/P Fertiliser

Production of a mixed nitrogen-phosphorus fertiliser by a new method has been evolved at the National Chemical Laboratory, Poona. Rock-phosphates are added to commercial hydrochloric acid at a temperature of 40°C. to 45°C., followed by addition of ammonium sulphate to the slurry. On grinding, the final product is a free-flowing powder, stable to the atmosphere. It contains 7.4 per cent of nitrogen and 15 per cent of phosphorus.

Formosa's First Plastics Plant Completed

Formosa Plastics Co., a private company financed by Government and US aid loans, opened the island's first plastics plant recently at Kaohsiung. Nearly all raw materials are available locally and production is stated to be 120 tons a month. Another private company also backed by US finance, China Artificial Fiber Corporation, is operating a new plant capable for the production of 150-denier rayon.

Dutch Urea Plant Contract for South Africa

African Explosives and Industries have accepted the offer of Werkspoor N.V., Holland, for the supply of a new urea plant. The plant forms part of the £10 million expansion programme announced recently. It is planned to complete the plant in 2½ years.

General Tire's New Wear-resistant Synthetic Rubber

A new synthetic rubber described as having greater wear resistance than any known form of rubber has been announced by General Tire and Rubber Co. The trade name GenthaneS has been given to the rubber which is based on polyurethane.

Resistance to oil and ozone and lack of deterioration under indefinite storage are stated to be the special properties of GenthaneS. Considerable quantities of the new synthetic are under test by tyre technologists to assess its suitability for this purpose. The company expects GenthaneS to make marked inroads into an estimated 200 million lb. market for other types of natural and synthetic rubber. Markets for the new synthetic will also be sought in valves, gaskets, oil seals, oil hose cable, insulation and vibration absorbers.

Australian Titanium Plant Expansion

Australian Titan Products Pty. Ltd., recently announced that it planned to increase the output of titanium oxide pigment to 20,000 tons per year at Burnie, Tasmania. Cost of expansion is estimated at £3 million, most of which cost will be borne by the parent company, British Titan Products Co. Ltd. The plant began production in 1949 and was designed to produce 1,800 tons of pigment per year. Since then it has been expanded and at present it is producing 8,000 tons per year. Extensions now being carried out are expected to increase the output to 10,000 tons next year.

Raw material for the plant, ilmenite, has been obtained until recently from India, but shipments are now being received from Western Australia.

US Plastics and Resin Production in 1956

Preliminary figures quoted by the US Tariff Commission for US production of plastics materials and synthetic resins total 3,977 million lb., compared with 3,739 million lb. in 1955. Cellulosic plastics totalled 147 million lb. Of the various plastics and resin materials, vinyl and vinyl copolymers headed the list with a total production of 760 million lb.; and styrene came next with 679 million lb. Polythene production reached 566 million lb., phenolic, etc., 563 million lb., alkyd, 474 million lb., and urea and melamine, 342 million lb.

New Montecatini-Fauser Plant for Urea

The Spencer Chemical Company of Kansas City, US, are building another Montecatini-Fauser plant for the production of urea. Three times larger than the plant already in operation, it will bring the world's total of plants producing urea by this process to 25.

Petrocarbon Chemical Industry for Chile?

CORFO, the Chilean Development Corporation, is studying the possibilities of establishing a petrocarbon chemical industry using by-products of the State Petroleum Enterprise ENAP and the steel industry CAP. It has invited interested firms to register for the purpose of submitting tenders.

Fertiliser Plant in South America

A modern fertiliser manufacturing plant was opened on 27 April at San Pedro de Macoris, in the Dominican Republic, by the firm of Fertilizantes Quimicos Dominicanos, C. por A. The plant, which cost over RD.$500,000, is reported to have an annual capacity of 240,000 tons of fertiliser, and has a labour force of some 125. It is

believed that present operations are directed more towards the mixing of fertilisers imported in bulk, for sale on the national market and use mainly on the sugar estates. The use of fertilisers has increased steadily in the Dominican Republic over the last few years. Imports in 1956 totalled 22,212 metric tons of which 19,541 metric tons came from USA and 2,232 metric tons from Germany. The principal fertilisers in use are ammonium sulphate, superphosphates, potash muriate and ammonium phosphate. Local fertiliser production has risen from 4,033 metric tons in 1952 to over 11,000 metric tons in 1956.

Usage of US Synthetic Rubber Falls

US rubber consumption in July at 109,331 tons was about 2,000 tons less than in the previous month. This figure was still higher, however, than the figure of 103,000 tons in July 1956. Consumption of both natural and synthetic rubber fell. Natural rubber usage was down from 41,105 tons in June to 39,287 tons in July 1957. Comparative figures for synthetic rubber in July were 69,383 tons, 70,230 tons in June, and 58,046 tons in July 1956. The ratio of natural to synthetic rubber fell in July from 36.92 to 36.54.

Lebanese Duty on Washing Agents

The Lebanese Government has exempted washing agents, detergents and emulsifiers (excluding soaps) from customs duties where they are intended for industrial use; for other categories, the duty is doubled to 50 per cent.

High Purity Sulphuric Acid from Coke-Oven Gas

According to Concordia Bergbau AG, Oberhausen, Germany, high-purity sulphuric acid can be obtained from coke-oven gas at a cost of $6.30 per ton. Coke-oven gas is first washed with ammonia in an aluminium tower to recover 80 per cent of the hydrogen sulphide present. The hydrogen sulphide is then oxidised in the presence of a vanadium catalyst to give a 99.2 per cent yield of sulphur trioxide which is treated by condensation and pressure filtration to produce 99.9 per cent pure sulphuric acid.

Extended Protection Sought for Indian Acid Industry

A request by the Indian stearic acid and oleic acid industries that protection for these acids should be continued for a further period of three to five years, is being considered by the Indian Tariff Commission. At the opening of the inquiry, the chairman of the Commission said that five units were at present producing these acids in India. Annual capacity was reported at 2,010 tons of stearic acid and 554 tons of oleic acid. While capacity had not risen appreciably, there had been a substantial increase in production. Current domestic demand for stearic acid was stated to be 1,500 tons and that for oleic acid, 250 tons. By 1960, these totals are expected to rise to 2,700 tons and 425 tons respectively.

Tata Oil Mills, Bombay, are understood to be planning to produce these acids in the near future, together with other fat acids.

Ferrous Sulphate Production at Polish Iron Works

Plant for the recovery of ferrous sulphate which was formerly lost as a waste product, has been installed at the Florian iron works in Poland. This is the first establishment of its kind in Poland to institute production of ferrous sulphate, and it is expected that the Florian works will turn out annually some 800 tons of the chemical. The product will enable the Polish chemical industry to economise considerably on purchases of ferrous sulphate from West Germany.

Chemicals at Leipzig Autumn Fair

Chemical products and equipment will be featured at the Leipzig Autumn Fair to be held from 1 to 8 September. In the chemical section exhibits will include organic and inorganic products, dyes and pigments, acethyl-cellulose, photo-gelatine, pharmaceuticals, laboratory and fine chemicals, borax, artificial resins, fatty acids, etc. Equipment will cover plant and apparatus for the chemical, rubber and plastics industries, including washing, dyeing and cleaning machinery.

International Symposium on Saline Water Conversion

An international symposium on saline water conversion will be held in Washington DC, US, in the first part of November. About 30 technical papers will be presented by specialists from the US, the UK, the Continent and other parts of the world. Details can be obtained from the Division of Physical Sciences, National Academy of Sciences, 2101 Constitution Avenue, NW, Washington 25, DC.

New Pyrochlore Deposits in Nyasaland

Two new deposits of pyrochlore, source of niobium, have been found in the Southern Province of Nyasaland by the Geological Survey Department, says an announcement published on 27 July. There are now four known deposits of pyrochlore in the territory, all in the Southern Province. Further investigations will have to be carried out to assess whether the pyrochlore is present in sufficient quantities to be of real economic importance.

Dutch Cellophane Plant

Hollandsche Kunstziide Industrie Breda's (AKU) new cellophane plant was opened on Monday. Initially, the capacity will be 35 tons a week.

New German Copolymer

A new plastics material composed of a copolymer of butadiene, styrene and acrylonitrile, has been manufactured in Germany for a few months under the trade name Novodur.

Incorporation in the polystyrene molecule of modifying agents such as butadiene and acrilonitrile produces, it is claimed, a material which is highly resistant to impacts, compared with polystyrene, and has better stretch properties.

The material is being used in the production of equipment for petrol refineries, but its principal application is in the manufacture by moulding and injection of equipment with high resistance to shocks, as, for example, in the textile and motor industries.

Antibiotic Industry for South Korea

South Korea's leading pharmaceutical companies are to start producing antibiotics in the autumn including penicillin, aureomycin and streptomycin. Necessary equipment, financed with $750,000 of US aid, was installed this month.

Drop in Chilean Nitrate Production

Nitrate production in Chile during the first four months of this year, totalling 439,581 tons, was 10 per cent below the same period of 1956. The Chilean Government has exempted phosphate fertilisers from import duties.

British Chemical Firms at Helsinki Fair

MANY chemical and allied companies are among the 500 British manufacturers taking part in the British Trade Fair and Exhibition to be held at Helsinki from 6 to 22 September. Sponsored by the Federation of British Industries, the London Chamber of Commerce and the Finnish British Trade Association, the fair has as its patrons H.M. the Queen and Doctor U. K. Kekkhonen, President of Finland.

Showing in the chemicals, drugs and dyestuffs section are: Abbey Chemicals, Albright and Wilson, Alginate Industries, Anglo-Finnish Hardware, Associated Lead Manufacturing Export Co., BB Chemical Co., Frederick Boehm, Bowmans Chemicals, British Chrome and Chemicals, British Industrial Solvents, British Resin Products, Brotherton and Co., W. J. Bush and Co., Cabot Carbon, Cimex-Fraser Tuson, Croda, Docker Brothers, Ferro Metal and Chemical Corporation, Houseman and Thompson, Ilford, ICI, Johnson Matthey, Kemball Bishop and Co., Lankro Chemicals, May and Baker, Patentools, Plus Gas, Propert, W. F. Rhodes and Co., Richardson Printing Ink, Saltcake Association, Simoniz, Slip Products and Engineering.

Included in the oils and fats section will be Shell Petroleum and C. C. Wakefield. Among plastics manufacturers will be British Geon, British Xylonite, Distrene, Holoplast, and J. W. Roberts.

Other sections include: abrasives and refractories, engineering, instruments, food and chemical preparing machinery, mechanical handling equipment, pumps, raw materials and non-ferrous metals, etc.

EQUIPMENT REVIEW

Chemical Plant: Laboratory Apparatus Safety and Anti-Corrosion Products

CHEMICAL RESISTING GLOVES

PROTECTIVE gloves, which are also chemical-resisting and thereby suited to a variety of uses in the chemical industry as they afford protection against flame and chemical burns, etc., have been introduced by the protective equipment division of Martindale Electric Co. Ltd., Westmorland Road, London NW9.

Tough p.v.c. coating is bonded on to an interlock fabric lining. The number of seams in these p.v.c. gloves has been reduced to a minimum and they are positioned away from wearing surfaces. To give particularly good freedom of movement, the gloves are moulded with thumb and fingers in the position of a relaxed hand. To avoid drag against the thumb when the wearer's hand is fully opened, there is no seam at the junction of thumb and index finger.

The gloves can easily be cleaned and sterilised by washing in boiling water using a mild detergent or soap. They can also be turned inside out for the linings to be washed thoroughly.

Service life of these gloves is stated to average between five and 12 times that of ordinary rubber or leather gloves. A variety of sizes and finishes for both men and women is available. Finishes are rough or smooth for medium, light or heavy work. Open or close fitting wrist-types can be obtained and also gloves with ribbed safety palms.

INDUCED ROLL SEPARATOR

RAPID MAGNETIC MACHINES LTD., Lombard Street, Birmingham 12, have introduced a new high intensity, induced roll separator which provides the necessary magnetic field for purification of free-flowing granular materials.

The basic unit has a 5 in. diameter roll, with two parallel 5 in. feed widths. Several such units may be fitted together to provide a separator with any number of rolls for difficult separations, or where selective separation of different materials is required.

The equipment is suitable for the purification of silica sand, abrasive grain, corundum, graphite, kyanite and slag, depending on the material size and magnetic susceptibility. Typical figures are 1½ tons per hour for the purification of silica sands.

Each magnet coil is rheostatically controlled, allowing variation of energy at each roll.

REINFORCED PLASTICS COATING

USING an extrusion coating technique, the plastics division of The Telegraph Construction and Maintenance Co. Ltd. (Telcon), manufacture several packaging materials, in which polythene is applied to paper, light boards, aluminium foil and cellulose film. Thin polythene sheet is reinforced internally with an open-mesh of fibreglass, Terylene or other suitable synthetic or natural textile, and the resulting product, named Telcomesh, is designed to have the impermeability and chemical resistance of polythene with increased mechanical strength, and a fair degree of translucency.

One of the uses for Telcomesh is as a lining for tanks intended to contain corrosive liquids, such as strong acids or concentrated hydrogen peroxide. It can also be used as a material for protective clothing for workers handling these substances, especially the last named, against which it is said to give a high degree of protection.

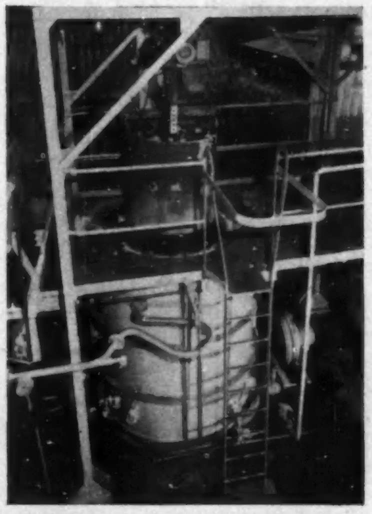
Telcomesh also enters the realm of large-scale packaging by its use as an 'outer' for the hygienic transport of large units in cold storage, as it is able to withstand low temperatures without cracking.

Breaking strain of Telcomesh is 45 lb. per in. for the 0.017-in. gauge, and 28 lb. per in. for the 0.009-in. gauge. The burst strength, at an average of 140 and 125 lb. per sq. in. for the thicker and thinner gauges respectively, is about 50 per cent greater than that of non-reinforced polythene of the same thickness.

DE-BONDING OF METAL FROM RUBBER

PLANT to salvage metal parts that have been defectively bonded to rubber is manufactured by W. C. Holmes Ltd., of Turnbridge, Huddersfield. Named the Holmes-Andre de-bonding process, it is based on the principle of destructive distillation in a closed vessel in the absence of air, a technique well established in industries such as coal gas manufacture and charcoal production.

In a plant already operating, at the London factory of a well-known rubber manufacturer, the charge of components weighing 10 to 15 cwt. is loaded into a container and thence into a vertical cylindrical retort, the cover of which is sealed down. A gas-fired furnace provides the heat necessary to distil the rubber and the process takes approximately seven hours during which the temperature is not allowed to exceed 500°C. The products of distillation are gaseous, liquid and solid, the two former being separated by cooling the hot vapours leaving the retort whilst the solid product is a carbonaceous residue left in the container. The metal parts remaining in the container are cleaned by a mild barrel tumbling process and the carbon residue disposed in the usual way.



Metal to be reclaimed being lowered into the Holmes-Andre de-bonding plant

100 C.C. SAMPLE MILL

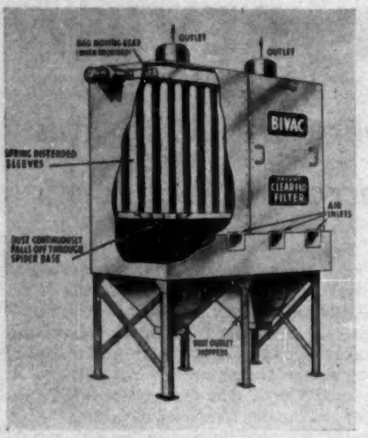
DESIGNED for grinding samples of under 100 c.c., Glen Creston Ltd., of 41 Church Road, Stanmore, have produced a portable electric sample mill. With a grinding speed of about 30 gm. per min. the mill is 8 in. long by 4 in. high, and weighs 5½ lb. It is claimed that most materials ground on this mill will pass through a 60- or 85-mesh sieve, while 100-mesh is about the smallest size that can be achieved. The mill is priced at £9 18s.

Laboratory sample mill

FABRIC AIR FILTER

A FILTER for industry designed to cope with dust loads of 4/6 tons per hour, at the rate of 1,000 cu. ft. per minute is being marketed by Bivac Air Co., Beehive Works, Portwood, Stockport. With such loadings, a total dust retention is said to have been registered as high as 99.7 per cent with dust particle size down to 0.5 micron.

The principle of the Bivac 'Clear-Flo' is that the dust is collected on the outside of the tubes of filter cloth, using spring



Air filter for high dust loads

distended frames or springs to prevent the cloth from collapsing. The collected dust remains on the outside of the cloth, and in general drops off by the pull of gravity.

Where certain dusts have had to be treated or coated with fatty acids, it is sometimes necessary to have dust-unloading gear fitted. This unloading is achieved by moving the base holding the filter tubes a matter of ½ in. per lineal foot, the complete cycle usually taking one minute. The movement, therefore, is gentle and long bag life is claimed. Since with this design the filter bag unloading is largely automatic, there is a constant resistance, with consequent air volume, a desirable feature with most chemical processes.

A pilot plant is available at the maker's works for testing clients' products, and in more difficult cases the pilot plant can be taken to site and run under working conditions where the temperatures and humidities require special consideration.

FLOATLESS LIQUID LEVEL CONTROL

A NEW floatless liquid level control is now available from Meynell and Sons Ltd., Montrose Street, Wolverhampton, for a wide range of industrial applications where it is necessary to control the level of liquid in boilers, tanks, or other vessels. The level control has been designed for use in conjunction with electrically driven pumps and incorporates the Teddington liquid level switch. The unit is suitable for steam boiler applications where it can be used for feed water pump control and/or a low water alarm and cut-out.

The liquid level control switch comprises two probes, each consisting of an invar rod in a brass tube. The invar rod is connected to the brass tube at one end, the other remaining free. The rods bear on either end of a pivoted switch lever. One of the rods has a small continuously heated electrical heater wound around it so that one probe is always hotter than the other. The other probe works in opposition to compensate for changes in the ambient temperature. When the probes are immersed in liquid the heat is rapidly dissipated and the difference in temperature between the two probes is not sufficient to operate the switch. When the level falls, however, and the probes are no longer immersed in liquid, the heat is dissipated at a much slower rate. This increases the difference in temperature between the two probes causing the switch to close the pump circuit.

The main body housing the switch probes is normally made in close-grained high duty cast iron (semi-steel). For special applications it can be supplied in gunmetal or aluminium. The switch head is completely sealed from the liquid under control.

Two models are being manufactured. Mark III WX/AD/1 is suitable for controlling the water level of steam boilers having a maximum steam working pressure of 120 p.s.i. and the control of non-corrosive fluids at or near atmospheric temperature at a maximum working pressure of 350 p.s.i.

Model mark III WX/AE/1 is available for operation where a rapid restoration of level is not considered essential or is not required at all. The switch in this case will operate in 32/38 seconds of level change. This model is not recommended for use with steam and should not be used where the maximum temperature exceeds 250°F.

CURRENT DENSITY INDICATOR

As an aid to production in the electro-plating industry, English Electric, Ltd., of Stafford, are marketing a portable current density indicator. By giving a direct reading in amperes per square foot, current density in the electrolyte at any point of any number of loaded electro-plating vats to be checked is indicated, and the operating currents can then be adjusted for maximum plating efficiency and consistency of quality.

The apparatus consists of a robust moving-coil ammeter connected in series with a plate electrode of known surface area. The electrode is immersed in the electrolyte between the component to be plated and the anode. When contact is made to the work bar through the forked spike on the ammeter case, a direct indication of current density in the vat at that point is given on the ammeter dial.

Two electrodes are supplied, one of stainless steel for use in stannate tin, zinc and cadmium vats where current density does not exceed 50 amperes per square foot, and a second patented glass-backed electrode for use in chromium and bright nickel vats where current density is up to 250 amperes per square foot. Selection of the correct electrode enables readings with an accuracy of ± 5 per cent to be obtained.

MICRO-BALANCE

Micro-balance by Shandon Scientific Co. Ltd., 6 *Cromwell Place, London SW*7, *details of which were given in Equipment Review*, 10 *August, p.* 217

ROLL CLADDING TECHNIQUE

A NEW method for the external cladding of rolls, shafts, tubes and drums with stainless steel is now in production at the Hull Works of Rose, Downs and Thompson Ltd. This patented process was developed on the Continent, and claims to overcome the difficulties encountered in other methods in that a perfect bond is obtained between the cladding and the foundation body.

The cladding process is particularly advantageous in the case of internally heated or cooled rolls and drums which, after cladding, are suitable for working within a temperature range of minus 40°C. to 300°C. The clad rolls can also be ground and polished to precision limits. Hard finishes can be applied by electro-deposition of chromium on the stainless-steel cladding. The process can be applied to materials other than chromium.

EMERGENCY REPAIR KIT

THISTLEBOND repair kits now being marketed by Ferguson and Timpson Ltd. have been developed to meet the need for carrying out emergency repairs to machinery, equipment and piping. Essentially, each kit consists of a supply of cold setting Ceemar epoxide resins and activators, supplied by E. M. Cromwell and Co. Ltd. and produced by Bakelite Ltd., and glass cloth, mat and tape for reinforcement purposes, together with the equipment necessary for applying the materials, such as scissors and brushes.

Simple repairs are carried out by cleaning and drying the metal surfaces, applying resin to the area which has to be repaired and bedding down glass cloth on to this resin layer. Further coats of resin and layers of glass cloth are then applied until a sufficiently strong repair has been completed.

For pipe work, glass tape is used instead of cloth and for difficult contours a fairing compound is used which, when mixed with the resin, gives a dense, fibrous mass and enables the contours to be built up to the thickness required.

Repairs generally set within four hours; but this period can be reduced to 30 minutes by the application of warmth from a steam hose or by chemical heating pads. Tests have shown that repairs on 3-in. diameter cold water piping have withstood pressure of up to 1,500 lb. per square inch, while on steam mains a Thistlebond repair has resisted a pressure of 150 lb. per square inch.

PEOPLE in the news

● DR. R. OWENS who, as announced in CHEMICAL AGE last week has been appointed Director of Explosives and Chemical Production at the Ministry of Supply, was a chemist with Brotherton and Co. from 1916–1918. After serving as a pilot in the RAF, he joined the Ministry Research Establishment at Sutton Oak in 1924 and worked on chemical warfare development. In 1939 when the establishment was expanded, Dr. Owens was appointed superintendent and in 1942 he became senior chemist at the Directorate General of Explosives. He was also connected with research that took place at that time which led to the introduction of DDT. After the war Dr. Owen served as an adviser between the Ministry of Supply and industry, on supply of explosives. He became Assistant Director of Explosives and Chemical Production in 1948, a post he held until his new appointment.

● SIR CHRISTOPHER HINTON, managing director of the industrial group of the UK Atomic Energy Authority, last week visited the Stone, Staffs., factory of Quickfit and Quartz, Ltd., makers of interchangeable laboratory and chemical glassware. This factory produced the glass plant in which was made the fissile material for Britain's first atomic bomb. Sir Christopher, who was accompanied by Lady Hinton, was welcomed by SIR GRAHAM CUNNINGHAM, chairman and managing director of Quickfit and Quartz, Ltd., and of the Triplex group.

● MR. HENRY J. ELLIOTT, founder director of H. J. Elliott Ltd., manufacturers of laboratory glassware, E-MIL Works, Treforest Industrial Estate, Pontypridd, Glam., celebrated his 80th birthday, on Thursday, 15 August. The occasion was marked by a presentation by the chairman, MR. ARTHUR COCHRANE, on behalf of the directors, of a gold fountain pen, following an informal luncheon at E-MIL Works. Mr. Elliott, who pioneered the commercial production of volumetric laboratory glassware in the UK in 1914, is now a very hale and hearty 80 years, and, although no longer tied to active routine matters at the works, still drives his car to the factory most days each week, to keep a fatherly interest in affairs, particularly new technical developments.

H. J. Elliott

● DR. G. MACDOUGALL, B.Sc., Ph.D., has been appointed deputy director of research, Printing, Packaging and Allied Trades Research Association. He has been information officer since 1947 and will continue to be responsible for the information side of PATRA's activities. He will act as director of research when Dr. Harrison is away from the laboratories.

● MR. L. S. BULL, B.Sc., F.R.I.C., head of research section of the Weston Research Laboratories, Cox Lane, Chessington, Surrey, is from 1 September taking up an appointment as senior lecturer in chemistry with the West Ham College of Technology, Romford Road, London E15.

● MR. E. ARNOLD RUNNING, editor of CHEMICAL AGE from December 1950 to May 1956, has been appointed editor of *Hardware and Metal*, published by Maclean-Hunter, Toronto. A Canadian by birth, Mr. Running returned to Canada in June last year with his family and joined Maclean-Hunter shortly afterwards.

● MR. JAMES DOUGLAS COUSIN, secretary of the ICI salt division, Winsford, has been appointed secretary of the ICI £100 million Severnside project. Aged 39, Mr. Cousin is a solicitor and joined the company at London in 1947. He has been secretary of the salt division since 1950. The Severnside project will be concerned mainly with chemicals derived from oil.

● New president of the South African Association for the Advancement of Science is DR. A. E. H. BLEKSLEY, Professor of Applied Mathematics at the University of the Witwatersrand.

● MR. D. P. BILTON, sales director of Vizgol Oil Co., is to take up residence in South Africa later this year in order to take personal charge of the company's affairs there. This move has been made, the company states, because of the development of Vizgol Oil and agricultural products in the Union.

MR. JOHN D. LODGE, has been appointed sales director in place of Mr. Bilton as from 1 October. MR. S. P. BILTON, export manager, Mr. N. F., Bilton, technical adviser to the company and MR. J. W. SMITH, agricultural chemical sales manager have been appointed executive directors.

● MR. HOWARD J. MORGENS, has succeeded MR. NEIL MCELROY as president of the Procter and Gamble Co., US. Mr. McElroy has been appointed as US Secretary of Defence.

● An additional fellowship for postgraduate research has been awarded by British Oxygen to MR. R. D. JOHNSTON, B.Sc., A.I.M., 25 Wandle Road, Wandsworth Common, London SW17, for research in the department of metallurgy at Battersea College of Technology, London.

● DR. MARGARET D. WRIGHT and MR. D. W. BICHENO have been appointed joint deputy managing directors of the Vitamins group of companies.

● DR. J. M. DODDS, O.B.E., M.A., B.Sc., B.Sc.(Eng.), Dr. Ing. (Aachen), has been appointed manager of the research department of Metropolitan-Vickers Electrical Co. Ltd., Trafford Park, Manchester 17. He succeeds MR. B. G. CHURCHER, who relinquishes the post but who will continue to act in an advisory capacity. Dr. Dodds joined the company in 1928 as a college apprentice, subsequently working in the research department as a physicist in the radio laboratory and later as electronics group leader. He was appointed assistant manager of the research department in 1954. A fellow of the Institute of Physics, a member of the Institution of Electrical Engineers, Dr. Dodds is also an associate member of the Institution of Mechanical Engineers.

J. M. Dodds

UK Chemical Trade in 1956

BRITISH industry's performance in export markets last year is described in an article in this month's 'Bulletin for Industry' published by the Treasury. Expansion of UK exports generally followed the pattern of growth in world trade. Main progress was in the engineering field but in no major commodity group did the UK reach the average increase in world trade.

In the chemical field UK exports rose by 4.9 per cent in 1956. World exports of chemicals rose by 10.8 per cent. Dyestuffs and fertiliser exports fell and there was no increase in exports of drugs. Largest increases were registered by the US and Germany. There have been signs, however, of a revival in UK trade.

Obituary

MR. JAMES WILLIAM KENDALL who died at Wolverhampton on 24 August at the age of 49 was head of nuclear engineering development for John Thompson Ltd. He was one of Britain's leading authorities on the design of gas-cooled graphite-moderated reactors.

He joined John Thompson in a senior advisory capacity from the UKAEA (Industrial Group) in June 1956. With the AEA he had been engineer-in-charge of design and construction of projects including Harwell BEPO, the Windscale production piles and the Dounreay fast-breeder reactor. During the war he was assistant director, filling factories, working for Sir Christopher Hinton. Mr. Kendall leaves a widow and a daughter.

Chemical Stocks and Shares

Markets Under a General Depression in August

Overseas Interests of Evans Medical

MARKETS during August and particularly towards the end of the month have been under a general state of depression. The Middle East situation, following political developments in Syria, weakness on Wall Street and a continued pressure against sterling have all helped to keep stock markets at a low level.

Chemical shares have likewise aroused very little interest, apart from Bakelite Ltd., who on very good buying advanced to 24s. Elsewhere British Chrome 10s 6d, British Oxygen 35s 6d, Distillers 24s 1½d, Gas Purification 20s 3d, Coalite and Chemicals 4s 3½d, and Lawes Chemicals 20s on their final dividend of 12½ per cent (same), have all remained firm.

During the last week Evans Medical Supplies have drawn attention to an agreement negotiated with Liberia. The company has been appointed sole purchasing agent for all pharmaceutical products, dressings and medical equipment required by the Liberian Government. The contract covers an initial period of five years and places Evans Medical in a good position for the future.

The business was registered in 1925 to take over the company of Evans, Sons, Lescher and Webb Ltd., formed in 1902. Evans Medical have branches all over the world. Under excellent management and staff relations, this group looks well placed to capture the growing market of the underdeveloped countries. At the present, overseas enterprises absorb about half of the group's production.

Results have been satisfactory over the last few years and Evans Medical Supplies seem a good investment to add to the average portfolio. The 5s ordinary shares at today's price of 7s on the 10.8 per cent dividend, yield 7.7 per cent and are about twice covered by earnings.

1957 High	1957 Low	Security	27 August	Change month	Gross div. %	Times covered	Yield %
23/7½	17/9	Albright and W. 5/- ...	21/9	+6d	18	2.4	4⅛
24/6	20/-	Bakelite 10/-	24/-	+9d	15	1.4	6¼
34/3	22/4½	Borax Dfd. 5/-	28/6	—5/1½	9½	3.8	1½
13/10½	10/3	Bt. Glues 4/-	12/6	—6d	18½	2.5	5⅞
6/4½	4/9	BIP 2/-	5/10½	+3d	20	2.0	6¾
35/-	27/3	Bt. Xylonite	31/-	+1/9	11	2.0	7⅛
60/3	48/3	Fisons	56/6	—1/9	15	2.6	5¼
42/9	24/-	Glaxo 10/-	42/9	+9d	10¹/₆	5.7	2¼
34/6	24/6	Hickson and W. 10/- ...	34/6	+1/3	15	4.1	4⅜
46/6	38/10½	ICI	42/1½	—2/10½	10	2.8	4½
4/9	2/7½	Kleemann 1/-	3/4½	+3d	25	1.2	7⅜
22/1½	16/4½	Laporte 5/-	18/6	—	16	2.8	4⅜
19/3	12/4½	Monsanto 5/-	16/7½	—1/1½	13½	2.3	4
15/6	12/9	Reichhold 5/-	14/10½	—6d	20	2.4	6¼

TRADE NOTES

New Branch Office

A new branch office of the instrumentation division of Costain-John Brown Ltd., has been opened at Jaffrey's Chambers, 63 Brown Street, Manchester 2. (Blackfriars 5575.) Mr. W. Brown, area instrument engineer, is in charge.

High-Temperature Alloys

The name Nimocast has been introduced by Henry Wiggin and Co. Ltd., Wiggin Street, Birmingham 16, to cover a range of new high-temperature nickel-chromium base alloys for use in the cast form. Six alloys are now available in the series, five of which were developed in the laboratories of the Mond Nickel Co. Ltd.

New North-East Office

The new north-eastern sales and service office of Fielden Electronics Ltd., Stockton-on-Tees, will be officially opened on 5 September.

Unilux Translucent Sheeting

Production of Unilux translucent sheeting has been started at the Watford works of UAM Plastics Ltd., a subsidiary of Universal Asbestos Manufacturing Co. Ltd. The sheet is made by a thermosetting process from clear polyester resins reinforced with glass fibre mat. Another UAM associate, Union Fibre Pipes has installed additional plant at Harefield, Middx., enabling output to be doubled.

Molybdenum Disulphide Additive

A new additive for petrol and diesel engines is being introduced by Rocol Ltd. Called Molyspeed, it is a suspension of molybdenum disulphide in SAE 30 premium motor oil, and mixed at the rate of half pint to eight pints of engine oil.

Jenolite Danish Licensee

Mr. V. Kronman, Nybrogade 14, Copenhagen K, has been appointed licensee and agent in Denmark for the Jenolite group of companies, replacing former connections with Dansk Jenolite Svend Skaarup, Aarhus.

New Hydrocarbon Wax

LATEST development in microcrystalline waxes has resulted in the production of Microwax 557, now available from Charles H. Windschuegl Ltd., 1 Leadenhall Street, London EC3. The new product is a high melting-point, hydrocarbon wax which is produced under strict laboratory control, ensuring constant quality. It is particularly suitable for liquid polishes, no other waxes being necessary. A floor or furniture polish consisting entirely of hydrocarbons can, it is said, be produced with this product, paraffin wax and white spirit. Technical data is available from the distributors, who are part of the Amber group of companies.

Odex Ltd.

Deodor-X Co. of England Ltd., manufacturers of deodorants, disinfectants, air sprays and polishes, Ellesmere Port, Ches., have now changed their name to Odex Ltd. This change does not affect the ownership, nor will there be any alteration in the location, system of operating or in the products made.

Potassium Permanganate

A slight increase in prices for potassium permanganate BP and technical is announced from 30 August by Boots Pure Drug Co. Ltd. The increase amounts to ½d per lb. for BP, and 7s per cwt. for technical.

BX Plastics Buy Extrudex

BX Plastics, British Xylonite Co.'s subsidiary has purchased Extrudex of Bracknell, Berks., manufacturers of chemical plant and tubing in rigid vinyl material. Extrudex will continue to operate as a separate organisation.

New Skin-Packaging Process

A cold application, water-miscible coating, which is stated to give a heat-sealable surface and makes the production of skinpacks speedier and cheaper, has been developed by Richard Hodgson and Sons Ltd., Beverly, Yorks. Known as Bevatoid dispersion coating it can be applied over printing and is claimed to be suitable for all types of papers and boards. All the normal plastics used for skin-packaging seal effectively to the coating. Distributors for the product are W.B.C. (Packings) Ltd., 195 Hammersmith Road, London W6.

Q and Q Distributors

Quickfit and Quartz Ltd., Stone, Staffs, have appointed two further firms as official distributors and stockists of the Quickfit range of laboratory glassware. They are Hospital and Laboratory Supplies Ltd., Charterhouse Square, London EC, and Scientific Furnishings Ltd., Poynton, Ches. Armand Dutry and Co. Ltd., Adeco House, Hyde Park Gate, London SW, and Ets Armand Dutry and Co., Rue Gallait, Brussels, are appointed exclusive distributors in the Belgian Congo.

Teaching Aids Sub-Committee

THE Science Masters' Association has formed a teaching aids sub-committee to collect information concerning teaching aids and prepare lists of these for circulation to its members.

Industrial organisations are asked to supply the committee with details of any booklets, wall charts, models, showcases, filmstrips, etc., which would be of use to schools. Details, which should include the name of the teaching aid, type, cost, etc., should be sent to the Secretary, 24 Coniston Road, Bromley, Kent.

Commercial News

Higher Half-year Profits for Albright and Wilson

A NET PROFIT of £664,000 against £556,000 for the first half-year of 1956 is shown by the unaudited results of the Albright and Wilson group of chemical manufacturing companies. There is £646,000 (£539,000) attributable to the parent company.

Simultaneously, the directors have declared a 5 per cent interim dividend in respect of 1957, as previously when the year's total was 18 per cent.

It will be recalled that in 1956 the company's US subsidiary, Oldbury Electro-Chemical Co., was transferred to Hooker Electrochemical Co., in exchange for shares in that company. As Hooker is not a subsidiary, therefore, its profits have not been consolidated in the group figures, and only dividends received from Hooker have been included, whereas in the 1956 figures, the full profits of Oldbury Electro-chemical were consolidated.

The resulting reduction in profits, it is stated, has been more than offset by the improved results of the rest of the group. Indications are that this satisfactory position will be maintained for the second half of 1957.

Boots Pure Drug Co.

At a board meeting of Boots Pure Drug Co. Ltd., on 26 August, a resolution was passed that an interim dividend for the half-year ending 30 September 1957 of, 3 per cent, less tax, be paid on the 30 September 1957, to the ordinary shareholders on the register on the 9 September 1957.

Borax (Holdings)

Group trading profits of Borax (Holdings) for the nine months ended 30 June were £2,639,534. Net profit was £1,682,383. Because of a scheme of reorganisation in 1956 it is not practicable to give comparative figures, nor can an exact comparison be made with three-quarters of the trading results for the full year ended 30 September, 1956.

Esso Petroleum Co.

Esso Petroleum Co. are to raise £6.5 million by a public debenture issue towards an estimated £40 million capital construction programme in the year to June 1958. The prospectus, to be published next Monday, will offer £7 million 6 per cent first debenture stock 1977–80 at 96. Lists will be open on 5 September, with a payment of 25 per cent.

Standard Oil Co. (New Jersey), the parent company is to put a further £10 million into the business in £1 ordinary shares at par.

Capital development schemes in hand or planned are the Milford Haven refinery and the new petrochemical plant at Fawley. Esso are also taking a 40 per cent interest in the Irish Refining Co., to operate a refinery at Whitegate, Co. Cork. The company has, too, 17 tankers on order or under construction.

Lawes Chemical Co.

As forecast, Lawes Chemical Co. are repeating a dividend of 12½ per cent or ordinary capital increased by a rights issue from £340,845 to £400,000 Group profit for the year ended 30 June 1957 is lower by £6,000 at £65,887 (£72,106) after tax of £74,633 (£78,095).

Monsanto Chemicals

Net sales of Monsanto Chemicals Ltd. and UK subsidiaries for January to June totalled £7,930,927 (£6,934,343) a record for any first six months and 14.4 per cent up over the same period of 1956. Exports were up 24 per cent. Net income, after estimated taxes of £443,200 (£404,200), was £427,538 (£383,522).

An interim of 5 per cent is declared on ordinary shares as doubled by cash and capitalisation issues. It is stated that although competition and increasing costs are limiting the benefits of the higher turnover, the directors can see no reason at present for amending their previously expressed view that the year's results should justify a total dividend of 13½ per cent (22½ per cent on old capital).

United Glass Bottle

An interim of 3¾ per cent is maintained by United Glass Bottle Manufacturers Ltd., on ordinary for the year ending 4 January 1958. Last year a total dividend of 11¼ per cent was paid.

National Chemical Products

Higher profits and all-round improvements are reported by National Chemical Products of South Africa, in which the Distillers Co. Ltd. have a substantial interest. Consolidated profit, before taxation increased to £305,130 for the year ended 31 March last from £226,740. Tax absorbed £97,227 (£66,081). An increase of the final dividend to 8¾ per cent has been proposed by the directors, thus making a total of 12½ per cent (10 per cent).

In his annual report, Mr. J. L. Irvin said that the current year's accounts contained a full year's profits earned by Poly-Resin products, compared with three months' results in 1956. National Chemical Products are the only company solely making synthetic resins in South Africa. Competition has been intense, however, and application has been made to the Board of Trade and Industries for some measure of protection. Trading has been difficult due to occasional dumping of overseas supplies in the Union.

Mention is made in the report that the new phthalic anhydride and acetic acid plants are operating well and that extensions to the latter plant are in progress.

The company has introduced froth flotation reagents to the mining industry upon which development work is being carried on in the Union and overseas. Negotiations for the marketing of the reagents in the US are stated to be in an advanced stage.

Another development of promise is a new product derived from fermentation residues for use in the animal feed industry. Polyester resins are now being made by Poly-Resin Products. This subsidiary has also introduced a number of resins for the footwear industry, which have been widely adopted in the Union. They are to be sold overseas as well. Export sales have, in fact, doubled during the last two years and now amount to 10 per cent of the turnover.

Market Reports

TRADE RECOVERS FROM HOLIDAYS

LONDON There have been no outstanding features on the week and in most sections of the market the movement against contracts has been reasonably good for the period. New business on home account has shown a little more activity with buyers covering forward requirements. The volume of export trade shows little change and a steady flow of enquiries has been recorded.

The price position remains steady and firm and this also applies to the coal-tar products section of the market where the movement generally is satisfactory.

MANCHESTER With the seasonal holiday influence steadily waning trading conditions on the Manchester chemical market are almost back to normal. The call for contract deliveries of textile and other industrial chemicals during the past week has been on a satisfactory scale, and a fair number of additional enquiries from home consumers have been dealt with. Shipping business generally is maintained. Except for continued uncertainty in the non-ferrous metal compounds the undertone of the market keeps firm. There is a fair demand for several fertilisers, and a steady outlet is being found for most of the tar products.

GLASGOW A much better week's trading is reported in the Scottish heavy chemical market. From a quiet opening, improvement was noted as the week progressed due to the fact that most of the holiday periods are now over and a return to normal business can be expected. Requirements against both spot and contract deliveries were in demand.

Prices continue firm with little or no alteration. As reported last week, the demand for agricultural chemicals has remained quiet, while export continues favourable.

BRITISH CHEMICAL PRICES

These prices are checked with the manufacturers, but in many cases there are variations according to quality, quantity, place of delivery, etc.

Abbreviations: d/d, delivered; c.p., carriage paid; ret., returnable; non-ret. pack., non-returnable packaging; tech., technical; comm., commercial; gran., granular.

All prices per ton unless otherwise stated

GENERAL CHEMICALS

Acetic Acid. D/d in ret. barrels (tech. acid barrels free); in glass carboys, £8; demijohns, £12 extra. 80% tech., 10 tons, £97; 80% pure, 10 tons, £103; commercial glacial, 10 tons, £106.

Acetic Anhydride. Ton lots d/d, £136.

Alum. Ground, f.o.r., about £25. MANCHESTER: Ground, £25.

Aluminium Sulphate. Ex-works, d/d, £15 10s. MANCHESTER: £16 to £18 10s.

Ammonia, Anhydrous. Per lb., 1s 9d to 2s 3d.

Ammonium Chloride. Per ton lot, in non-ret. pack, £30 2s 6d.

Ammonium Nitrate. D/d, in 4-ton lots, £31.

Ammonium Persulphate. Per cwt., in 1-cwt. lots, d/d, £6 13s 6d; per ton, in min. 1-ton lots, d/d, £123 10s.

Ammonium Phosphate. Mono-and di-, ton lots, d/d, £106 and £97 10s.

Antimony Sulphide. Per lb., d/d UK in min. 1-ton lots: crimson, 4s 7d to 5s 0½d; golden, 2s 10½d to 4s 3½d.

Arsenic. Ex-store, £45 to £50.

Barium Carbonate. Precip., d/d, 4-ton lots, bag packing, £41.

Barium Chloride. 2-ton lots, £49.

Barium Sulphate [Dry Blanc Fixe]. Precip. 2-ton lots, d/d, £35.

Bleaching Powder. Ret. casks, c.p. station, in 4-ton lots. £30 7s 6d.

Borax. Ton lots, in hessian sacks, c.p. Tech., anhydrous, £66; gran., £45; crystal, £47 10s; powder, £48 10s; extra fine powder, £49 10s; BP, gran., £51; crystal, £56 10s; powder, £57 10s; extra fine powder, £58 10s. Most grades in 6-ply paper bag, £1 less.

Boric Acid. Ton lots, in hessian sacks, c.p. Tech., gran., £74 10s; crystal, £82 10s; powder, £80; extra fine powder, £82; BP gran., £87 10s; crystal, £94 10s; powder, £92; extra fine powder, £94. Most grades in 6-ply paper bag, £1 less.

Calcium Chloride. Ton lots, in non-ret. pack: solid and flake, £16.

Chlorine, Liquid. In ret. 16-17-cwt. drums d/d in 3-drum lots, £40.

Chromic Acid. Less 2½%, d/d UK, in 1-ton lots, per lb., 2s 2¼d.

Chromium Sulphate, Basic. Crystals, d/d, per lb., 8½d; per ton, £79 6s 8d.

Citric Acid. 1-cwt. lots, per cwt., £10 15s.

Cobalt Oxide. Black, per lb., d/d, bulk quantities, 13s 2d.

Copper Carbonate. Per lb., 3s 8d.

Copper Sulphate. F.o.b., less 2% in 2-cwt. bags, £80 5s.

Cream of Tartar. 100%, per cwt., about £11 12s.

Formaldehyde. In casks, d/d, £37 5s.

Formic Acid. 85%, in 4-ton lots, c.p., £86 10s.

Glycerine. Chem. pure, double distilled 1,260 s.g., per cwt., in 5-cwt. drums for annual purchases of over 5-ton lots and under 25 tons, £10 1s 6d. Refined pale straw industrial, 5s per cwt. less than chem. pure.

Hydrochloric Acid. Spot, per carboy, d/d (according to purity, strength and locality), about 12s.

Hydrofluoric Acid. 60%, per lb., about 2s 6d per lb.

Hydrogen Peroxide. Carboys extra and ret. 27.5% wt., £128 10s; 35% wt., d/d, £158.

Iodine. Resublimed BP, under 1 cwt., per lb., 14s 2d; for 1-cwt. lots, per lb., 13s 5d.

Iodoform. Under 1 cwt., per lb., £1 2s 3d; for 1-cwt. lots, per lb., £1 2s 6d.

Lactic Acid. Pale tech., 44% by wt., per lb., 14d; dark tech., 44% by wt., per lb., 9d; chem. quality, 44% by wt., per lb., 12¼d; 1-ton lots, ex-works, usual container terms.

Lead Acetate. White, about £154.

Lead Nitrate. 1-ton lots, about £135.

Lead, Red. Basis prices: Genuine dry red, £122 10s; orange lead, £134 10s. Ground in oil: red, £142; orange, £154.

Lead, White. Basis prices: Dry English in 5-cwt. casks, £128 10s; Ground in oil: English, 1-cwt. lots, per cwt., 194s.

Lime Acetate. Brown, ton lots, d/d, £40; grey, 80-82%, ton lots, d/d, £45.

Litharge. In 5-ton lots, £124 10s.

Magnesite. Calcined, in bags, ex-works, about £21.

Magnesium Carbonate. Light, comm., d/d, 2-ton lots £84 10s under 2 tons, £97.

Magnesium Chloride. Solid (ex-wharf), £17 10s.

Magnesium Oxide. Light, comm., d/d, under 1-ton lots, £245.

Magnesium Sulphate. Crystals, £16.

Mercuric Chloride. Tech. powder, per lb., for 5-cwt. lots, in 28-lb. parcels, £1 4s; smaller quantities dearer.

Mercury Sulphide, Red. 5-cwt. lots in 28-lb. parcels, per lb., £1 9s 3d.

Nickel Sulphate. D/d, buyers UK, nominal, £170.

Nitric Acid. 80° Tw., £35.

Oxalic Acid. Home manufacture, min. 4-ton lots, in 5-cwt. casks, c.p., about £131.

Phosphoric Acid. Tech. (s.g. 1.700) ton lots, c.p., £100; BP (s.g. 1.750), ton lots, c.p., per lb. 1s 4d.

Potash, Caustic. Solid, 1-ton lots, £95 10s; liquid, £36 15s.

Potassium Carbonate. Calcined, 96/98%, 1-ton lots, ex-store, about £74 10s.

Potassium Chloride. Industrial, 96%, 1-ton lots, about £24.

Potassium Dichromate. Crystals and gran., per lb., in 5-cwt. to 1-ton lots, d/d UK, 1s 1½d.

Potassium Iodide. BP, under 1-cwt., per lb., 10s 3d; per lb. for 1-cwt. lots, 9s 9d.

Potassium Nitrate. 4-ton lots, in non-ret. pack, c.p., £63 10s.

Potassium Permanganate. BP, 1-cwt. lots, per lb., 1s 11¼d; 3-cwt. lots, per lb., 1s 10¾d; 5-cwt. lots, per lb., 1s 10½d; 1-ton lots, per lb., 1s 10d; 5-ton lots, per lb., 1s 9½d. Tech., 5-cwt. in 1-cwt. drums, per cwt., £9 15s 6d; 1-cwt. lots, £10 4s 6d.

Salammoniac. Ton lot, in non-ret. pack., £47 10s.

Salicylic Acid. MANCHESTER: Tech., d/d, per lb., 2s 8½d.

Soda Ash. 58% ex-depot or d/d, London station, 1-ton lots, about £17 3s.

Soda, Caustic. Solid 76/77%: spot, d/d 1-ton lots, £33 16s 6d.

Sodium Acetate. Comm. crystals, d/d, £91.

Sodium Bicarbonate. Ton lot, in non-ret. pack., £18 10s.

Sodium Bisulphite. Powder, 60/62%, d/d, 2-ton lots for home trade, £42 15s.

Sodium Carbonate Monohydrate. Ton lot, in non-ret. pack, c.p., £57.

Sodium Chlorate. 1-cwt. drums, c.p. station, in 4-ton lots, about £85.

Sodium Cyanide. 96/98%, ton lot in 1-cwt. drums, £113 5s.

Sodium Dichromate. Crystals, cake and powder, per lb., 1s. Net d/d UK, anhydrous, per lb., 1s 1½d. Net. del. d/d UK, 5-cwt. to 1-ton lots.

Sodium Fluoride. D/d, 1-ton lots and over, per cwt., £5; 1-cwt. lots, per cwt., £5 10s.

Sodium Hyposulphite. Pea crystals, £38; comm., 1-ton lots, c.p., £32 10s.

Sodium Iodide. BP, under 1 cwt., per lb., 14s; 1-cwt. lots, per lb., 13s 2d.

Sodium Metaphosphate [Calgon]. Flaked, paper sacks, £133.

Sodium Metasilicate. D/d UK in ton lots, loaned bags, £25.

Sodium Nitrate. Chilean refined gran. over 98%, 6-ton lots, d/d c.p., £29 10s.

Sodium Nitrite. 4-ton lots, £32.

Sodium Percarbonate. 12½% available oxygen, per cwt., in 1-cwt. kegs, £8 10s 9d.

Sodium Phosphate. D/d, ton lots: di-sodium, crystalline, £40 10s, anhydrous, £88; tri-sodium, crystalline, £39 10s, anhydrous, £86.

Sodium Silicate. 75-84° Tw. Lancs and Ches., 4-ton lots, d/d station in loaned drums, £11 17s 6d; Dorset, Somerset and Devon, per ton extra, £3 17s 6d; Scotland and S. Wales, extra, £3. Elsewhere in England, not Cornwall, extra, £1 12s 6d.

Sodium Sulphate [Desiccated Glauber's Salt]. D/d in bags, £20.

Sodium Sulphate [Glauber's Salt]. D/d, £18 10s to £18 15s.

Sodium Sulphate [Salt Cake]. Unground, d/d station in bulk, £8. MANCHESTER: d/d station, £9 10s.

Sodium Sulphide. Solid, 60/62%, spot, d/d, in drums in 1-ton lots, £36 2s 6d; broken, d/d, in drums in 1-ton lots, £37 2s 6d.

Sodium Sulphite. Anhydrous, £71 10s; comm., d/d station in bags, £27-£28 10s.

Sulphur. 4 tons or more, ground, according to fineness, £20-£22.

Sulphuric Acid. Net, naked at works, 168° Tw. according to quality, £11-£12 12s 6d; 140° Tw., arsenic free, £9 2s 6d; 140°Tw., arsenious, £8 14s 6d.

Tartaric Acid. Per cwt.: 10 cwt. or more, £14; 1 cwt., £14 5s.

Titanium Oxide. Standard grade comm., rutile structure, £182; standard grade comm., anatase structure, £167 (from 1st Feb.).

Zinc Oxide. Max. for 2-ton lots, d/d, white seal, £95; green seal, £93; red seal, 2-ton lots, £90.

SOLVENTS AND PLASTICISERS

Acetone. All d/d. In 5-gal. drums, £128; in 10-gal. drums, £118; in 40–45-gal. drums, under 1 ton, £93; 1–5 tons, £90; 5–10 tons, £89; 10 tons and up, £88; in 400-gal. tank wagons, £85.

Butyl Acetate BSS. 10-ton lots, £173

n-Butyl Alcohol BSS. 10 tons, in drums, d/d, £152.

sec-**Butyl Alcohol.** All d/d. In 5-gal. drums, £168; in 10-gal. drums, £158; in 40–45-gal. drums, under 1 ton, £133; 1–5 tons, £130; 5–10 tons, £129; 10 tons and up, £128; in 400-gal. tank wagons, £125.

tert-**Butyl Alcohol.** 5-gal. drums, £195 10s; 40/45-gal. drums: 1 ton, £175 10s; 1-5 tons, £174 10s; 5-10 tons, £173 10s; 10 tons and up, £172 10s.

Diacetone Alcohol. Small lots: 5-gal. drums, £177; 10-gal. drums, £167. 40/45-gal. drums: under 1 ton, £142; 1-9 tons, £141; 10-50 tons, £140; 50-100 tons, £139; 100 tons and up, £138.

Dibutyl Phthalate. In drums, 10 tons, d/d, per lb., 2s; 45-gal. drums, d/d, per lb., 2s 1½d.

Diethyl Phthalate. In drums, 10 tons, per lb., 1s 11½d; 45-gal. drums, d/d, per lb., 2s 1d.

Dimethyl Phthalate. In drums, 10 tons, per lb., d/d, 1s 9½d; 45-gal. drums, d/d, per lb., 1s 10¾d.

Dioctyl Phthalate. In drums, 10 tons, d/d, per lb., 2s 8d; 45-gal. drums, d/d, per lb., 2s 9½d.

Ether BSS. 1-ton lots, drums extra, per lb., 1s 11d.

Ethyl Acetate. 10-ton lots, d/d, £145.

Ethyl Alcohol [PBS 66 o.p.]. Over 300,000 p. gal. 2s 11½d; d/d in tankers, 2,500-10,000 p. gal., per p. gal., 3s 1¾d. D/d in 40/45-gal. drums, p.p.g. extra, 1d.
Absolute alcohol (75.2 o.p.), p.p.g. extra, 5d.

Methanol. Pure synthetic, d/d, £43 15s.

Methylated Spirit. Industrial 66° o.p.: 500-gal. and up, d/d in tankers, per gal., 5s 4d; 100-499 gal. in drums, d/d, per gal., 5s 8½d. Pyridinised 64 o.p.: 500 gal. and up, in tankers, d/d, per gal., 5s 6d; 100-499 gal. in drums, d/d, per gal., 5s 10½d.

Methyl Ethyl Ketone. All d/d. In 5-gal. drums, £183; in 10-gal. drums, £173; in 40–45-gal. drums, under 1 ton, £148; 1–5 tons, £145; 5–10 tons, £144; 10 tons and up, £143; in 400-gal. tank wagons, £140.

Methyl *iso***Butyl Ketone.** All d/d. In 5-gal. drums, £209; in 10-gal. drums, £199; in 40–45-gal. drums, under 1 ton, £174; 1–5 tons, £171; 5–10 tons, £170; 10 tons and up, £169; in 400-gal. tank wagons, £166.

*iso***Propyl Acetate.** In drums, 10 tons, d/d, £137; 45-gal. drums, d/d, £143.

*iso***Propyl Alcohol.** Small lots: 5-gal. drums, £118; 10-gal. drums, £108; 40-45 gal. drums: less than 1 ton, £83; 1-9 tons, £81; 10-50 tons, £80 10s; 50 tons and up, £80.

RUBBER CHEMICALS

Carbon Disulphide. According to quality, £61-£67.

Carbon Black. Per lb., according to packing, 8d-1s.

Carbon Tetrachloride. Ton lots, £83 15s.

India-Rubber Substitutes. White, per lb., 1s 8¾d to 2s 0½d; dark, d/d, per lb., 1s 3d-1s 5½d.

Lithopone. 30%, about £59.

Mineral Black. £7 10s-£10.

Sulphur Chloride. British, about £50.

Vegetable Lamp Black. 2-ton lots, £64 8s.

Vermilion. Pale or deep, 7-lb. lots, per lb., 15s 6d.

COAL-TAR PRODUCTS

Benzole. Per gal., min. 200 gal., d/d in bulk, 90's, 5s 3d; pure, 5s 7d.

Carbolic Acid. Crystals, min. price, d/d bulk, per lb., 1s 4d; 40/50-gal. ret. drums extra, per lb., ½d. Crude, 60's, per gal., 8s 4d.
MANCHESTER: Crystals, d/d, per lb., 1s 4d-1s 7d; crude, naked, at works, 8s.

Creosote. Home trade, per gal., according to quality, f.o.r. maker's works, 1s-1s 9d.
MANCHESTER: Per gal., 1s 2d-1s 8d.

Cresylic Acid. Pale 99/100%, per gal., 6s 6d; 99.5/100%, per gal., 6s 8d. D/d UK in bulk: Pale ADF, per imperial gallon f.o.b. UK, from 7s 3d; per US gallon, c.i.f. NY, 95 cents.

Naphtha. Solvent, 90/160°, per gal., 5s 1d; heavy, 90/190°, for bulk 1,000-gal. lots, d/d, per gal., 3s 11d. Drums extra; higher prices for smaller lots.

Naphthalene. Crude, 4-ton lots, in buyers' bags, nominal, according to m.p.: £19-£30; hot pressed, bulk, ex-works, £40; refined crystals, d/d min. 4-ton lots, £65.

Pitch. Medium, soft, home trade, f.o.r. suppliers' works, £10 10s; export trade, f.o.b. suppliers' port, about £11.

Pyridine. 90/160, per gal., 17s 6d-20s.

Toluole. Pure, per gal., 5s 9d; 90's, d/d, 2,000 gal. in bulk, per gal., 5s.
MANCHESTER: Pure, naked, per gal., 5s 6½d.

Xylole. According to grade, in 1,000-gal. lots, d/d London area in bulk, per gal., 6s 2d-6s 6d.

INTERMEDIATES AND DYES
(Prices Nominal)

m-**Cresol** 98/100%. 10 cwt. lots d/d, per lb., 4s 9d.

o-**Cresol** 30/31°C. D/d, per lb., 1s.

p-**Cresol** 34/35°C. 10 cwt. lots d/d, per lb., 5s.

Dichloraniline. Per lb., 4s 6d.

Dinitrobenzene. 88/99°C., per lb., 2s 1d.

Dinitrotoluene. Drums extra. SP 15°C., per lb., 2s 1½d; SP 26°C., per lb., 1s 5d; SP 33°C., per lb., 1s 2½d; SP 66/68°C., per lb., 2s 1d.

p-**Nitraniline.** Per lb., 5s 1d.

Nitrobenzene. Spot, 90-gal. drums (drums extra), 1-ton lots d/d, per lb., 10d.

Nitronaphthalene. Per lb., 2s 5½d.

o-**Toluidine.** 8-10-cwt. drums (drums extra), per lb., 1s 11d.

p-**Toluidine.** In casks, per lb., 6s 1d.

Dimethylaniline. Drums extra, c.p., per lb., 3s 5d.

BS Tables for Hydrochloric Acid

A NEW edition of the 'British Standard for density-composition tables for aqueous solutions of hydrochloric acid' (B.S. 976: 1957), which was first issued in 1941, is now available. Sixteen pages of tables based on the International Critical Tables give density in g./ml. of the aqueous solution, mass in grammes of HCl in 100 grammes of aqueous solution, and mass in grammes of HCl in 1 litre of aqueous solution. Numerical data remain unchanged for the temperature range 0°C. to 40°C. and the density range 1.000 to 1.150, but the table for more concentrated solutions, which was previously given for 20°C. only, has been supplemented by data for other temperatures. Arrangement of the table is such that the necessity for interpolation is reduced to a minimum thus making interpolation simple when the need arises.

Text matter has been revised to take account of the fact that the 1936 version of B.S. 718 ('Density hydrometers') has been replaced by B.S. 718:1953, 'Density and specific gravity hydrometers'. Full instructions are given on the use of the tables in conjunction with these instruments including the corrections to be applied in various circumstances with worked examples.

Copies of this Standard are obtainable from British Standards Institution, Sales Branch, 2 Park Street, London W1, price 7s 6d.

Irradiated Polythene for Cables and Wires

IRRADIATED polythene is being used by British Insulated Callender's Cables Ltd. as insulation material in the manufacture of a selected number of types of small coaxial radio frequency cables. Irradiation has been found to reduce greatly deformation of the core during soldering. These cables are of a standard construction. Although the power factor is slightly increased, other electrical characteristics are virtually unimpaired, and the cables are recommended for normal RF applications at frequencies up to 200 Mc/s.

Irradiated polythene equipment wires with improved soldering properties are now available, together with a similar type of wire which is also satisfactory for continuous operation up to 100°C. The company state that the latter type may also be operated at 120°C. for 1,500 hours and for shorter periods (approximately 1 hour) up to 250°C., provided that care is taken to ensure that the insulation is not placed in contact with bare copper.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents),' which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s 3d including postage; annual subscription £8.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection on 9 October.

Device for controlling the supply of liquid to a distillation apparatus. Child, W. A. T. L. **784 401**

Purification of crystals and concentration of solutions. Phillips Petroleum Co. **784 520**

Dyestuffs of the anthraquinone series. Ciba Ltd. **784 221**

Dressings for pest control. Neuhäuser, R., and Czerny, J. **784 402**

Curing of polymerisable materials. Imperial Chemical Industries, Ltd. **784 611**

Production of silica-containing aerogels. Monsanto Chemical Co. **784 391**

Esters of organic dithiophosphinic acids. Lubrizol Corp. **784 612**

Disazo-dyestuffs copper complexes thereof and processes for making them. Ciba Ltd. **784 613**

Acetals of substituted acrylamides. Du Pont De Nemours & Co., E. I. **784 225**

Antituberculosis compositions. Imperial Chemical Industries, Ltd. **784,226**

Purification of ethylene glycol by distillation. Imperial Chemical Industries, Ltd., and Spirey, H. **784 614**

Detergent compositions. Shell Refining & Marketing Co., Ltd. **784 228**

Production of inorganic oxide aerogels. Monsanto Chemical Co. **784 392**

Method of regenerating a platinum-alumina catalyst. Sinclair Refining Co. **784 229**

Method and apparatus for carrying out endothermic chemical reactions. Esso Research & Engineering Co. **784 414**

Manufacture of an improving ingredient for baked products and of bread containing same. Brabender, C., and Brabender, C. W., [trading as Brabender, O. H. (Firm of)]. **784 416**

Ammonia stills. Simon-Carves, Ltd. **784 584**

Apparatus for the distribution of lubricants. Soc. Autolube. **784 577**

Flexible liquid containers. Imperial Chemical Industries, Ltd. **784 528**

Diuretics comprising acylated aminotriazines. Imperial Chemical Industries, Ltd. **784 615**

Composition for the control of undesirable vegetation. Dow Chemical Co. **784 332**

Benzhydryl ethers of alkamines and thioalkamines. Schering Corp. **784 334**

Method of and apparatus for wet-treating threads, particularly viscose rayon threads. Pensotti, A., [trading as Pensotto Di Ezio Pensotti, A.] **784 423**

Method and means of producing an atmosphere protective against silicosis. McIntyre Research Foundation. **784 489**

Aluminium oxide powder manufacture. McIntyre Research Foundation. **784 490**

Manufacture of silicone oils. Farbenfabriken Bayer AG. **784 424**

Extraction and purification of hecogenin. Glaxo Laboratories, Ltd. **784 536**

Preparation and use of desulphurisation catalysts. British Petroleum Co., Ltd., Northcott, R. P., and Housam, E. C. **784 426**

Sodium metasilicate compositions. Alcock (Peroxide), Ltd. **784 538**

Method and apparatus for the production of pure iron, and iron carbon alloys including carbon and alloy steel. Arata, V. S. **784 587**

Lubricating composition. Esso Research & Engineering Co. **784 337**

Production of the antibiotic griseofulvin. Glazo Laboratories, Ltd. [Cognate application 9 013.] **784 618**

Methods of manufacturing semi-conductive bodies. Philips Electrical Industries, Ltd. **784 431**

Obtaining alkaloids from veratrum drugs or extracts of veratrum drugs. Byk-Gulden Lomberg Chemische Fabrik Ges. **784 539**

Furnace for and method of making glass. Aktiebolaget Surte Glasbruk. **784 339**

Preparation of high quality dimethyl terephthalate. Du Pont De Nemours & Co., E. I. **784 248**

Cold separation of air. British Oxygen Co., Ltd. **784 253** **784 590**

Flue-gas valves for kilns of the ceramic industry. Braukmann, H. **784 346**

Metering device for liquids or solutions. Baldelli, G. **784 348**

Production of substituted meta-dioxanes. Imperial Chemical Industries, Ltd. **784 544**

Aliphatic chloro-epoxides. Union Carbide Corp. **784 620**

Catalytic cracking of hydrocarbon oils. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. **784 546**

Carbon-filled polyamides. Du Pont De Nemours & Co., E. I. **784 254**

Increasing the sulphur content of sulphur-containing dyestuffs of the phthalocyanine series. Cassella Farbwerke Mainkur AG. **784 353**

Glucose indicator. Lilly & Co., E. **784 548**

Bleaching compositions. Colgate-Palmolive Co. **784 452**

Preparation of chlorophenylchlorosilanes. General Electric Co. **784 260**

Tetrabisazo dyestuffs. Farbenfabriken Bayer AG. **784 622**

Hydrogenating aldehydes. Gulf Research & Development Co. **784 359**

Production of terephthalic acid. Deutsche Gold-Und Silberscheideanstalt Vorm. Roessler. **784 261**

Controlling devices in boiling pans, more particularly for boiling down sugar juices to crystallisation. Ditmar Zonen N. V. **784 458**

Glyoxalidine corrosion inhibitors. National Aluminate Corp. **784 623**

Radioactive polymerisation of styrene with unsaturated esters. Esso Research & Engineering Co. **784 624**

Apparatus for butt welding glass capillary tubes. Vapor Heating Corp. **784 463**

Modified lanolin. American Cholesterol Products, Inc. **784 465**

Preparation of supplements for animal feeding stuffs. Vitamins, Ltd. [Divided of 784 145.] **784 601**

Manufacture of technically pure δ-hexachlorcyclohexane. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. **784 270**

Production of iminodibenzyl and the resulting product. Geigy AG., J. R. **784 272**

Adhesive compositions. Armstrong Cork Co. **784 565**

Radiation-induced polymerisation. Yarsley (Research Laboratories)) Ltd., Dr. V. E. and Barb, W. G. **784 274**

Glass-to-metal seal. Atomic Energy of Canada, Ltd. **784 375**

Halogenated insecticidal compositions and processes for same. Hercules Powder Co. **784 275**

Vat dyestuffs of the pyrazinoanthraquinone series. Badische Anilin- & Soda-Fabrik AG. **784 476**

Purification of salicylic acid derivatives. Monsanto Chemical Co. **784 277**

Hydrocarbon purification. California Research Corp. **784 478**

1,2-Diaminocyclohexanes. Badische Anilin- & Soda-Fabrik AG. **784 626**

Conjugated-unsaturated aldehydo carboxylic acid esters. Badische Anilin- & Soda-Fabrik AG. **784 628**

Oxo process. Esso Research & Engineering Co. **784 629**

Organosiloxane emulsions. Midland Silicones, Ltd. **784 630**

Method of production, without catalyst, of synthesis gas from oxygen and hydrocarbons obtained by vaporisation of petroleum products. Montecatini Soc. Gen. Per L'Industria Mineraria e Chimica. [Addition to 783 141.] **784 378**

Method and apparatus for the manufacture of tempered safety glass. Compagnies Reunies des Glaces et Verres Speciaux du Nord de la France. **784 382**

Thiacoumarin derivatives. Geigy AG., J. R. **784 281**

Preparation of polyvinyl chloride. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. **784 283**

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DRAUGHTSMEN are required by the **NORTH THAMES GAS BOARD** at its **TAR AND AMMONIA PRODUCTS WORKS** at **BECKTON, EAST HAM, E.6.**

The posts offer possibilities of obtaining experience in the expanding field of chemical engineering for applicants who have had a sound mechanical training.

Starting salary will depend on age and experience.

The successful candidates will be required to join the Staff Pension Scheme.

Applications, giving age and full particulars, to the Staff Controller, North Thames Gas Board, 30 Kensington Church Street, W.8, quoting reference CA/389.

SITUATIONS VACANT

CHEMIST required for industrial plant engaged in the manufacture of felt and the processing of raw materials including wool carbonising. Successful applicant will have opportunity to study wool processing in all its aspects with chance of promotion in this department. All applications to be marked "Chemist." and addressed to The Secretary, **THE LANCASHIRE FELT CO. LTD.**, P.O. Box No. 7, West Street, Denton, Manchester.

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CIRCULAR STEEL TANK for sale. Four sections bolted together by flanges. To mount in a vertical position. Size 20ft. high by 3 ft. 6 in. diameter, with an outlet etc. From **F. J. EDWARDS LIMITED,** 359 Euston Road, London.

1. NO. 2 DEVIL DISINTEGRATOR, by Hardy Patent Pick Co., grinding chamber 30 in. diam., 29 in. Brass Rings, feed Hopper 13 in. by 7 in., ring oil bearings, pulley 14 in. diam. by 7 in. face. Good condition. **THOMPSON & SON (MILLWALL) LIMITED, MILLWALL, E.14. TEL. EAST 1844.**

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350g (2 available) totally enclosed **JACKETED PANS** 80 lb in jacket, 50 lb internal.
400g open top **JACKETED PAN,** open top, 80 lb in jacket.
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